

(En)visioning place-based adaptation to sea-level rise

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Sustainable climate change adaptation requires an understanding of people's place attachments, so that potential impacts and trade-offs are illuminated when making adaptation decisions. Methods are needed that elucidate these important, but often intangible, place attachments at risk. A study was undertaken to explore place attachment, and how these person-place bonds might be impacted by flooding and sea-level rise. It engaged with a small town in coastal Australia that is already highly vulnerable to flooding, and which has been subject to numerous policy directives intended to reduce climate change-induced flood risk. The town therefore acts as an analogue for climate change adaptation in other semi-rural coastal communities. Photo-elicitation was found to be highly effective at elucidating multifarious dimensions of residents' place attachment. The attachments that were likely to be affected by flooding (and adapting to flood risk) were encapsulated in: the personal and communal identities associated with the tourism and fishing industries, the sense of belonging from living and re-living family connections to local places, and the sense of community and enjoyment derived from diverse recreational activities. The photo-elicitation process provided different outcomes to conventional interviews, focus groups and questionnaires. Participants sought to both vision (by elucidating their current experiences) and re-envision (in advocating for different futures) their everyday experiences of adapting to flooding through their photographs and accompanying narratives. A video introduction to this paper is available at: <https://vimeo.com/83484905>.

Key words everyday life; coasts; photo-elicitation; visual methods; climate change; vulnerability

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Introduction

Successfully adapting to the challenges of climate change is increasingly recognised as an important policy goal at local, regional, national and international levels. While adaptation policy and planning continues at all of these scales, there is little agreement about what successful adaptation looks like to diverse actors, or how it might be achieved (Moser and Boykoff 2013). Metrics of loss and damage are possible for some climate impacts (e.g. loss of land or populations displaced because of sea-level rise) but difficulties are encountered in trying to understand the value of non-market entities: intangible but valued aspects of everyday life such as community cohesion, identity, self-determination and attachment to unique places (Graham *et al.* 2013). Understanding how people experience places and the people in them, and thus the potential trade-offs, limits,

and barriers encountered for different adaptation options, is essential if adaptation is to be effective, legitimate and equitable (Adger and Barnett 2009; Raymond and Brown 2011).

The academic work that investigates the social dimensions of climate change adaptation in threatened places tends to focus on iconic entities and places at risk, such as the Arctic regions and Pacific Atolls (Devine-Wright 2013). There is also complacency in European and other nations about what climate adaptation might mean for society, with a narrow focus to date on technological mechanisms rather than on the value-laden process of climate change adaptation (O'Brien *et al.* 2006; Graham *et al.* 2013). Yet, for places that are not situated on high-value land (e.g. away from financial centres of major cities), technological or engineering adaptations may not be economically feasible.

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With few exceptions (e.g. Geoghegan and Leyshon 2012; Karlsson *et al.* 2015), there is little understanding about how adaptation plays out in more geographically diverse regions at risk, such as in smaller semi-rural settlements.

Place attachment and climate change adaptation

One way to address these issues is to use a place-based approach. Understanding person–place bonds can help determine where limits and barriers to adaptation occur (Fresque-Baxter and Armitage 2012). It can shed light on the symbolic, cultural and psychological aspects of settlements and places, and the risks posed to them, both by climate change and by the trade-offs encountered when adapting to climate change (Hess *et al.* 2008; Adger *et al.* 2011). By explicitly focusing on adaptation in place, notions of fairness in adaptation are highlighted, bringing the discussion of precaution, rights and wellbeing to the fore (Adger *et al.* 2011). Methods that are geographically bound and culturally nuanced allow policymakers to view the diverse array of risks posed by climate change and climate adaptation to places that people value (Adger *et al.* 2011; Brace and Geoghegan 2011; Raymond and Brown 2011; Graham *et al.* 2013).

Place attachment can be useful as a conceptual lens for investigating meanings, identities and emotional bonds associated with people–place relations (Davenport and Anderson 2005; Willox *et al.* 2012). Place attachment can be used to explore the ascription of climate risks by individuals and communities (Raymond and Brown 2011), including both direct climatic impacts (e.g. sea-level rise) and indirect impacts (such as climate adaptation policies and interventions; Devine-Wright 2013). It can also provide an indication of the likely level of civic involvement in climate adaptation planning and implementation (Hess *et al.* 2008), and help identify existing strengths, resilience, innovation and adaptive capacity (Willox *et al.* 2012).

Other place-based concepts, such as place (e.g. Lyth *et al.* 2015), sense of place (Hess *et al.* 2008), place-based identity (Willox *et al.* 2012), and landscape (Brace and Geoghegan 2011), have provided insights into climate change adaptation decisionmaking. However, they tend to be temporally constrained; they usually refer to an individual's sense of belonging to place at a particular moment (Brace and Geoghegan 2011). In contrast, place attachment is about a relationship between people and places over time. Thus, place attachment is not a stable or static bond, but one that is constantly evolving and responding to stimuli in the social and physical landscape. It is this quality of place attachment that makes it ideal for studying how residents are likely to be impacted by climate change and adaptation over time.

Place attachment is a concept used across disciplines (Devine-Wright 2013), including geography, psychology, sociology and health, among others. Here, we draw on the definition provided by Brown and Perkins (1992:284): 'Positively experienced bonds, sometimes occurring without awareness, that are developed over time from the behavioural, affective and cognitive ties between individuals and/or groups and their socio-physical environment'. This definition is more comprehensive than that used in other climate change studies (e.g. Scannell and Gifford 2011; Willox *et al.* 2012) because it explicitly includes three dimensions of place attachment (see also Scannell and Gifford 2010): the person, the place, and the psychological process of engagement between place and person (the 'bond'). It recognises the ways in which those bonds can manifest (behaviour, affect, cognition). It also makes clear the importance of time (and therefore change), to place attachment. Note, however, that we recognise that place attachment bonds may not always be positive [following Devine-Wright 2013; e.g. see Marshall *et al.* (2007) who found a reduction in resilience in fisher communities where fishers had become 'excessively attached' (p. 383) to the fishing industry]. Figure 1 illustrates the conceptualisation of place attachment used in this study.

The *person* in this definition is the individual or group that hold a place attachment. Given that a person does not need to reside in a place to feel a sense of attachment to that place, climate change impacts can affect the place attachment of residents and non-residents of places at risk. In this study we are interested in the effects that climate change and adaptation have on the person–place bonds of residents of a place at risk of flooding from sea-level rise, acknowledging that further work is required to explore the views of non-residents.

Tuan (1977) conceptualised *places* as socially constructed phenomena – places are spaces that have been given meaning through human interactions. More recent scholarship has emphasised the agency within places. Rather than being static entities, places are

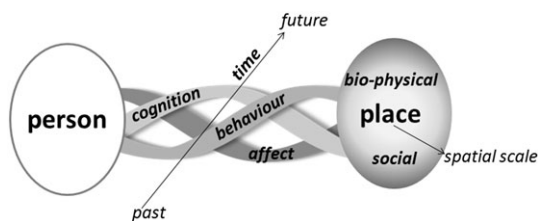


Figure 1 Place attachment: bonds (which may be manifest through cognition, affect, behaviour) between a person and a (physical or social) place (at a range of spatial scales) experienced over time

socially constructed: a product of unequal power relations, where an ongoing process of place-making sees places continually reproduced, creating winners and losers (Harvey 2001; Massey 2005). In some cases, particular places can come to hold deep symbolic meaning for particular cultures that value them. Although places are often understood to refer to a discrete, local and contained area (Lyth *et al.* 2015), the place in the person–place attachment can occur at different scales. These may be spatial scales such as an attachment at the level of the house, neighbourhood, city, world (Lewicka 2011); but they may also occur for different time scales, as a way of anchoring past experiences and orienting towards future goals.

An attachment to a place can be categorised along two components: to its physical features (e.g. being attached to a particular house) and social attachment (e.g. being attached to the people living within a house; Hidalgo and Hernández 2001). The climate a place experiences and the way it is experienced is a fundamental physical and cultural feature of that place (Hulme 2015). To date, the use of place within climate adaptation literature focuses on the physical (natural and built) dimensions of places and the expected changes to those characteristics. We seek to contribute to the emerging body of climate adaptation research that takes a more holistic understanding of the concept of place and climate, to include cultural meanings, experiences and constructs (e.g. as per Lyth *et al.* 2015; Hulme 2015).

The psychological bond between person and place comprises three interlocking dimensions: *affect, cognition and behaviour* (Brown and Perkins 1992). A person or group may hold very strong affective bonds with a particular place; even when this may lead to apparently maladaptive behaviours (and a manifestation of a seemingly negative person–place bond). For example, Tuvaluans hold a profound attachment to their island homeland, in terms of valuing their current lifestyle, culture and identity – and climate change is a heavily discounted risk – so climate change is not a current driver of migration (Mortreux and Barnett 2009). Cognition refers to the memories, beliefs and meanings someone ascribes to a place, and to their familiarity and knowledge of a particular environment. Burley *et al.* (2007) found this in the deep, generations-long familiarity coastal Louisianans held about their coastal wetland environment. Last, particular behaviours may express place–person attachment. For example, Hidalgo and Hernández (2001) identify ‘proximity-maintaining behaviours’ that involve maintaining closeness to a place, sometimes in the face of hardship or even danger. Through these three dimensions it is possible to see how places are constitutive of one’s sense of self (Casey 2001); people and place are essential to one another.

Photo-elicitation and place attachment

Latham (2003) argues that geographers need to be more imaginative in the types of methodologies they employ in order to fully recognise the construction of place and identity. This paper conceptualises place attachment as socially constructed, with attachments as much to ‘imagined’ and imaginaries as ‘reality’; and as a fluid concept, with ebbs and flows in person–place bonds occurring over time.

Photo-elicitation was chosen as it can reveal the fluid and social construction of place attachments over time (Baldwin and Chandler 2010). Photo-elicitation refers to the ‘simple idea of inserting a photograph into a research interview’ (Harper 2002:13). This photograph can be taken by the researcher, interviewee or found elsewhere (Harper 2002; Clark-Ibáñez 2004); but here photo-elicitation is used (as is common in social science, and geographical, research) to refer to photographs taken by participants through the research process (Rose 2012). Specifically, participants are briefed on the project aims, before being given time to take photographs that speak to these aims. The photographs are then discussed in an interview. This results in both verbal and visual data—an array of snapshots, and audio narratives of particular places—that together provide a more comprehensive understanding of the relationship between people, place and time (Anderson 2004).

Photo-elicitation is a method that can capture ethnographic-type insights into the concept of place in everyday life (Stedman *et al.* 2004). Photographs can be conceived as ‘proxy observers’ (Zimmerman and Wieder 1977), allowing rich and in-depth insights into the negotiation of everyday life. As Lombard (2013) suggests, photo-methods have an ability to capture the qualitative dimension of space: immediately conveying a sense of place. Photo-elicitation enables participants to examine taken-for-granted aspects of their everyday life and provides a means, through photos, of fostering a common understanding between the participant and the researcher (Harper 2002). Thus, it is not that traditional research interviews cannot access these insights (c.f. Hitchings 2012), but that photo-elicitation may be a more effective and efficacious method for accessing narratives of everyday life when encountering flood risk.

Previous studies have used photo-methods to examine the concept of place in the context of environmental change, including land management (Beilin 2005), and responses to climate change (Baldwin and Chandler 2010). There are also studies that have sought to understand the role of place attachment in climate adaptation decisionmaking through the use of questionnaires (Raymond and Brown 2011) and in-depth interviews (Wilcox *et al.* 2012). The aim of this paper is to use photo-elicitation to elucidate the person–place

bonds likely to be affected by climate change, and in doing so reveal how the concept of place attachment can be used to inform climate change adaptation decisionmaking.

Lakes Entrance: a place at risk of sea-level rise

Lakes Entrance is located on a stretch of coastline deemed to be one of the most vulnerable to flooding from climate-change-induced sea-level rise in Australia (DCC 2009). It has been at the centre of controversial decisions about adaptation to sea-level rise (Hurlimann *et al.* 2014), which has led local, regional and state government departments to seek fairer adaptation options. Five local and regional government partners worked with the University of Melbourne in a project seeking more equitable outcomes in adaptation to sea-level rise (Barnett *et al.* 2014). The research described in this paper extends that work. The research described here also adds to the geographical literature on public engagement with flooding and flood risk: particularly in terms of enriching our methodological toolbox for engaging with flood risk, and in seeking to address notions of justice and equity in flood management decisionmaking (e.g. Lane *et al.* 2011).

Lakes Entrance has a population of 4569 (ABS 2011). It is located ~300 km east of Melbourne, Australia (Figure 2). The coastal route between Sydney and Melbourne, the Princes Highway, runs along the Esplanade, the main road through the town. Lakes Entrance is a popular tourist destination – it is situated on a scenic beach and expansive inland lake system and is close to eight National Parks – and during the summer

months the population swells tenfold. Tourism and fishing are the major industries in the area. It is a relatively disadvantaged area, ranking in the lowest 13th percentile in the Australian Bureau of Statistics's Index of Relative Socio-Economic Disadvantage (ABS 2011). The population is also considerably older than average; 35.5% of the Lakes Entrance population are of post-retirement age compared with 19.7% for Australia.

Many of the town's shops and services are concentrated on the low-lying ground behind the Esplanade. Residential development is spread further into the hinterland, and along the coast. The land rises uphill behind the town. The low-lying parts of the town flood when the following biophysical processes coincide: high tides, strong winds, low atmospheric pressure, and flooding in the catchments that drain to the lakes (DCC 2009). There have been two major flood events in the last 15 years (1998 and 2007). Sea-level rise is expected to significantly increase the height and frequency of flood events (Arrowsmith and Race 2014).

Planning for sea-level rise in Lakes Entrance has been highly contested. State-level policies and litigation through the Victorian Civil and Administrative Tribunal have imposed adaptation decisions on the town. Residents and developers are required to incorporate predictions regarding sea-level rise (20 cm by 2040 and 80 cm by 2100; VCC 2013) into their current planning submissions. This has resulted in considerable conflict between the community and the local government; as well as between local government, and regional and state government authorities (Hurlimann *et al.* 2014).

In summary, Lakes Entrance is a small, low-lying coastal town. It experiences social disadvantage, is remote from major urban conurbations, and the local

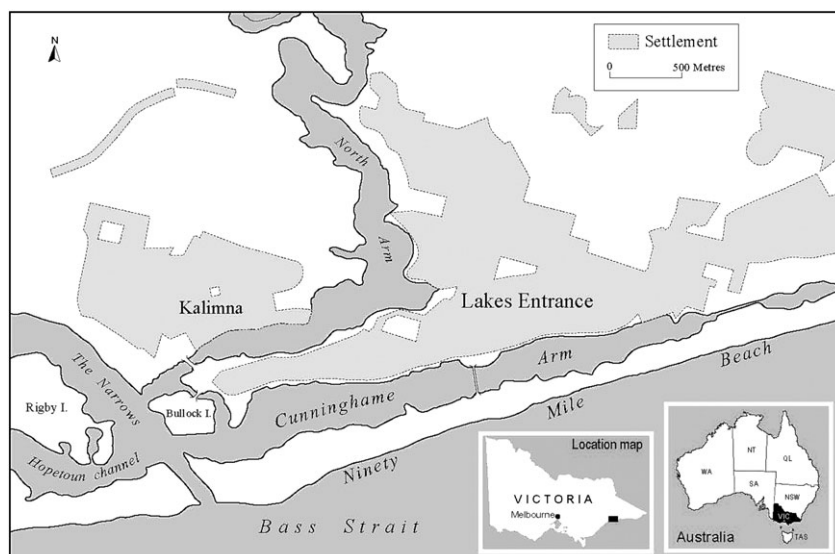


Figure 2 Location of Lakes Entrance and proximity to the ocean

economy largely depends upon natural resource and tourism industries. These characteristics of Lakes Entrance are similar to many smaller settlements in coastal regions elsewhere. These characteristics, together with the contested ongoing process of planning for sea-level rise in the town, mean it can act as an analogue (Ford *et al.* 2010) for the process of climate change adaptation in semi-rural coastal settlements.

The photo-elicitation process

Participants resident in Lakes Entrance and the surrounding area were recruited through snowball sampling, starting from a list of residents who had previously indicated their consent to be involved in further research as part of the University of Melbourne project. Recruitment posters were also displayed in public places such as the local library. Introductory workshops were held in Lakes Entrance in December 2012 for potential participants. The 30 participants who attended the workshops were broadly representative of the population of the area.

At each workshop, participants were briefed on the project aims, and an interactive presentation was given to encourage the participants to think about the photographs they might take, and the stories they might want to tell (as per Gustafson and Al-Sumait 2009). Participants who did not have their own digital camera were provided with one (many used the camera on their mobile phones). As there is vociferous debate about climate change in the town, participants were asked for their perceptions about flooding and sea-level rise in general, whether or not they considered flooding and sea-level rise to be linked to climate change.

Participants were asked to carry their camera with them for a week and take photos to illustrate what they valued about living in this place, and how this might be threatened by flooding or sea-level rise. Participants were encouraged to take as many photos as they wished, but to bring a maximum of 20 to their interview. This limit was to facilitate a wide range of potential topics for discussion, and to encourage participants to curate what could have been a large number of digital images into a manageable number for discussion at interview. This proved necessary, as some participants had taken several hundred photographs, many of which were almost identical.

Twenty-four of the original 30 participants returned to discuss their photos (uploaded onto a laptop) in an audio-recorded in-depth interview. The interviewer first asked participants to describe their set of photos, for example, whether there were any particular groups of photos, or to highlight those of particular importance. Interviewers also asked if there were any missing photos, or images interviewees could have taken but

did not want to (Harper 2002), and reflections on the photo-elicitation process.

Written consent was sought to archive and reproduce participants' photographs for educational and non-commercial purposes. The interviews were fully transcribed. Transcripts and photos were uploaded into NVivo 10, for concurrent text and visual analysis. The same thematic coding process was followed for both textual and visual data.

This paper endeavours to value visual (photos) and textual (interview quotes) data equally (Rose 2012). Due to space constraints, the photos are presented in thematic panels; and not all quotes have an associated image. Where a quote refers to a specific photo, it is highlighted in bold at the start of the quote.

Dimensions of place attachment

Participants used their photographs and subsequent interviews to elucidate a deeply held connection to place, from the scale of their own home to the wider region. Participants especially discussed how they derived enjoyment from the surrounding *physical* landscape – the beautiful views, abundant wildlife, and the outdoor recreational opportunities (walking, boating, surfing, fishing, golf) that the area affords. Many of the interviewees talked about how the landscape brought peace and tranquillity to their lives, and how this, together with the coastal climate, positively enhanced their wellbeing. Participants also discussed the *social* place attachments they held for the small country town feel of Lakes Entrance and surrounding communities. Last, a *long-term* connection to place, either through generations of family settlement, or through a personal lifetime of vacations to the area resulting in eventual permanent residence (often in retirement), fostered a sense of history and a deeply felt sense of belonging. The following participant photographs and interview quotes illustrate these dimensions of place attachment (as per Figure 1) and the ways in which they were interwoven in participants' narratives.

Figure 3a This is a very special spot for me, this is a family slip yard. I mean, it's beautiful ... I just feel like it's home. Like, it's totally in my blood ... It means a place that we have built up from the ground, that's still going, that my family have created and are still creating it. It means our connection to the water.

Figure 3b I: So you said the family ritual is to walk to the end of that concrete ... [pier]?

P: ... Yes, and sit there and meditate for a while. There are usually seals. Often there are dolphins coming out of the entrance so, you know, you have to sit there and watch the wildlife ... that's pretty important to us living here.



Figure 3 Participant photos (refer to text for full description and accompanying quotes): (a) a family boatyard, (b) family beach walk ritual, (c) 'Everybody knows everybody', (d) 'I mortgaged everything for this'

Figure 3c There's so many of the people that walk around, walking dogs or exercising and they are all pleasant, there are no muggers, there are no rat-bags. Everybody knows everybody ... to show what this actual place is and how wonderful it is that so many people can use it in peace and harmony and get on ... it hasn't changed, again, for 50 years or 50 plus years.

Figure 3d ... it's just part of the place where I live. I mortgaged everything to get a block that does that, to live on the water. I own it now but at the time it was a big risk to buy it.

Flooding and sea-level rise pose risks to person-place bonds

Current levels of flooding already pose risks to places that participants feel attached to. Participants discussed the current and possible future impacts of flooding and sea-level rise on *physical* features of places (e.g. Fishermans Landing jetty at Lake Tyers, Nungurner foreshore reserve picnic facility) as well as *social* attachments (e.g. a family fishing spot, a community picnic place). The places discussed were at a range of *spatial* scales: the individual scale (the participant's house, their family businesses), at a local scale (the beach, lake and creek side beauty spots; local community facilities such as the golf course and the surf club; local tourism and fishing businesses) and regional scales (the

Mallacoota coastline, surrounded by the Croajingolong National Park, about 200 km away). Participants also discussed the way flooding and sea-level rise threatened attachments between valued places and themselves, their families and friends, the wider community, and visiting tourists. The nature of these person-place attachments (*affective*, *cognitive* and *behavioural* bonds) and how they relate to current flooding and future sea-level rise is discussed below.

Many participants discussed the economic costs of floods. In doing so they demonstrated considerable knowledge of the local (*physical*) environment. One participant described the costs of a flood on the local golf course, where he was a volunteer:

Figure 4a During severe episodes, a couple of the fairways will flood without having water fall on them; they come up through the ground ... And it's salty ... And salt water can kill a green off ... and to replace a green you are probably looking around \$50,000.

A recurrent theme from participants' interviews was the reliance of the town on income from tourism. Several participants had used the exceptionally high water level occurring on the same day as the photo-elicitation workshop as a visual analogue for sea-level rise:

Figure 4b Hiring out boats to the tourists ... they have only got a short market to start with. So if something like this

happens, if you've got a high tide or whatever, and there is no access to the boats, well people won't take them out because it is a bit rough.

Many participants reiterated how a flood event impacts the tourism businesses in the area, and in turn, how the loss of infrastructure impacted their lived experience of valued places:

Figure 4c That whole area [Fishermans Landing jetty] went under with our last flood. So the council ... are going to pull it down, because the wood will be rotting and whatever. But families go there and fish ... This guy's now selling his [tourist cruise business] boat because he has got nowhere to moor it.

I: Do you think that's going to impact on the community?

Well, like I said, I take my grandchildren fishing there ... the shop openers are down [unhappy] because they are losing money, the holidaymakers go home ...

Flooding also threatened fishing and boatbuilding businesses. This was not only a potential economic threat, but a threat to industries to which families had cherished generations-long links. Note how the following quote demonstrates the thought process of the participant in composing and selecting this image, in order to tell a particular narrative:

Figure 4h What I specifically liked in this photo ... I didn't want dead fish and oil slick on the water to make it look like the fishing industry is destroying the environment, it was more the other way round – that the environment could be affecting the fishing industry, if that makes sense, because, as I said, my family has been involved in fishing forever here.

Flooding already impacts on valued places of recreation. A participant talked about the local foreshore reserve BBQ area, where he had been the previous weekend for a barbeque with 70 or so other local residents. He showed a picture of the area in the 2007 floods:

Figure 4d ... the flood got worse than this, later on. It got up a bit higher, but this shows you roughly what can happen. And this is just with normal floods.

Many participants raised concerns over the salinity of the Gippsland Lakes system, and how this might be changing. The quotes below and Figure 4e illustrate a long connection to the local environment, and also the considerable debate around the causes of vegetation dieback.

Figure 4e If you look just in that little corner, the tea tree's dead, and this has died, that whole row of tea tree ... So that

tea tree's disappeared into the lake in the last... well, I've lived there for 25 years but it's really deteriorated in the last 10. [15-year-old photo (inset) superimposed onto a photo taken for the project (main photo)].

There are now some mangroves in the Gippsland Lakes that weren't there 20 years ago ... One obvious thing is climate change, our change of salinity or change of dredging, or change of lots of things.

Figures 4d and 4e also demonstrates how participants went beyond the brief of the photo-elicitation exercise, adapting it to both vision and re-envision experiences of living with flooding and sea-level rise: the photographer behind 4d had put together a series of photographs to tell a story and to illustrate how things were changing because of flood damages to a valued place on the Lakes system; whereas the photographer of 4e had gone back through his archives to find a 15-year-old photo of the same scene, digitalised it, and superimposed it on the present-day digital photo taken for this project – in order to strengthen his narrative of concern.

Participants valued highly their perceived sense of social cohesion and community. Flood events, and tension over the frequency and severity of these floods (and how this may be affected by climate change), threatens these *social* attachments. This was demonstrated through a heated discussion between participants about links between climate change and flooding during the photo-elicitation workshop, and the following interview quotes:

Figure 4g I have spoken myself I suppose about flood waters as a child, that it comes and goes, it is no big deal, it's part of the furniture in a sense ... Of course, water on the road means lots of different things now, it's the thresh of change ahead, potentially ... and in this town it's quite a political thing in that the locals would probably just consider this a big puddle and very temporary. It comes, it goes [therefore] 'We Are Still Open' [for business].

... the thought of climate change and flooding here ... some may well acknowledge, privately, that it is something afoot and there is something going on, but we have got tourists coming and we can't go on about it too much, because this is our business.

When people say, 'Why do you believe it's happening?' it's like, 'How can you believe it's not happening, especially down here?' ... they believe that humans have no impact on it whatsoever and I just find that amazing ... So I have got into quite a bit of trouble around here, from that.

Fresque-Baxter and Armitage (2012) list many sub-dimensions of place identity, including those related to a sense of belonging, rootedness, and commitment to place. For many participants these aspects are closely

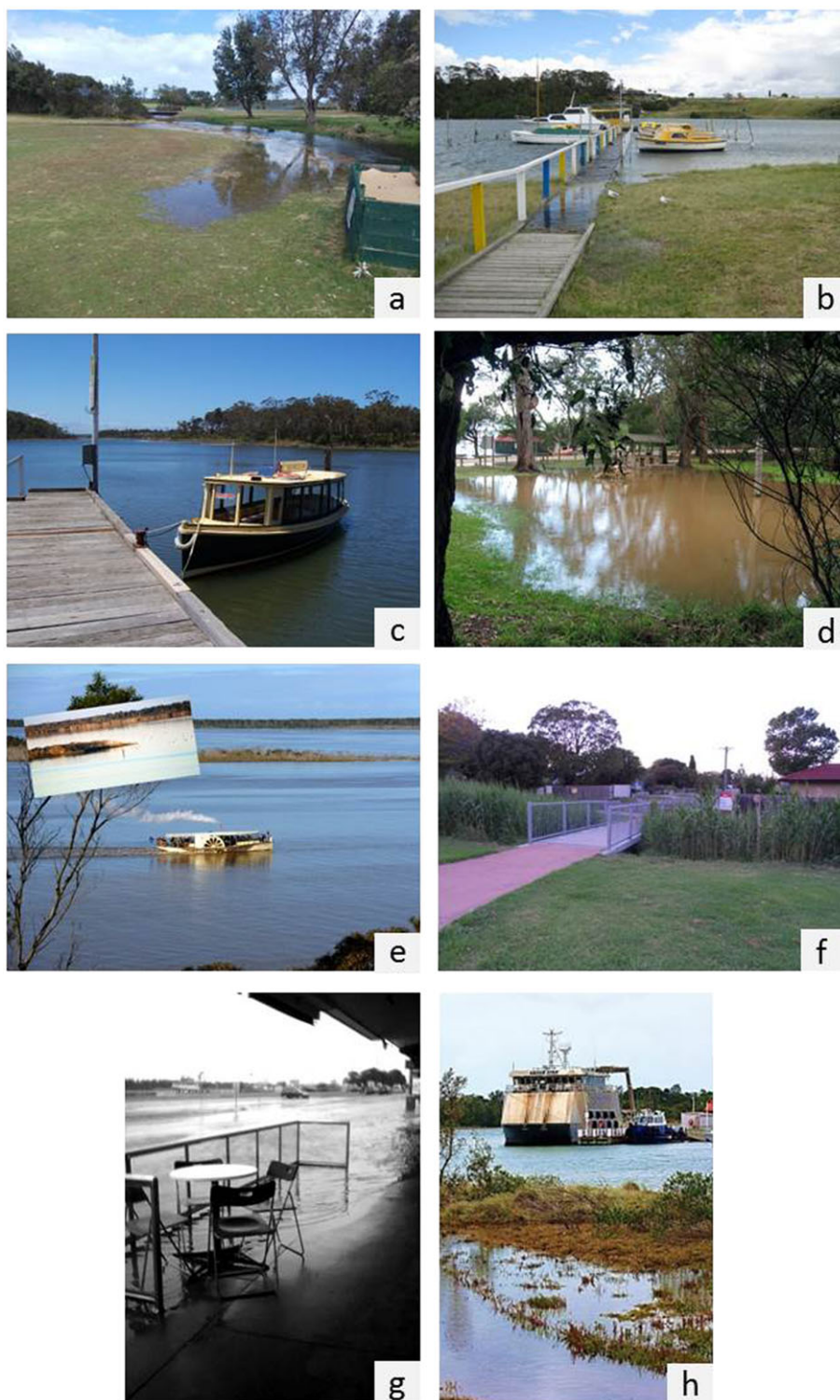


Figure 4 Participant photos (refer to text for full description and accompanying quotes): (a) golf course maintenance, (b) tourist boats, (c) pulling down the jetty, (d) flooded picnic site, (e) change to tea trees, (f) house for sale, (g) ‘Still open’, (h) family links to the fishing industry

linked to home ownership (something close to many Australians: the 'Australian dream' refers to owning your own detached home on a quarter acre block). Flooding is influencing these *emotional* and *cognitive* attachments, as flood events and their perceived changes in frequency and impacts (as well as changes in flood management) are already shaping perceptions of where is safe to live in town.

Figure 4f ... all the houses for sale along the creek, because they flood ... You would be a fool to buy that place in the park.

I personally wouldn't buy land in downtown Lakes Entrance because I'm going to be leaving it to my kids and I don't think it's a good investment [laughter]. It's as simple as that. I'd buy something on the hill.

Adaptation decisions pose risks to person-place bonds

Many of the photos that participants took, and stories they told, related to existing flood management infrastructure, and to building restrictions intended to accommodate projections of future sea-level rise. Participants discussed the effectiveness of these adaptation options and the impacts that they were having on the *physical* and *social* dimensions of place. In discussing these photos many participants also discussed the impact that future adaptation measures, particularly hard coastal protection, would have on their attachment to the socio-physical environment of Lakes Entrance.

The two main adaptation options that participants mentioned were accommodation (flood infrastructure, dredging, and building regulation) and protection (groynes and sea walls). Only one person remarked on the possibility of retreat (that future development should be concentrated up the hill). Many participants were especially animated when discussing photos that related to power and decisionmaking about flood risk.

One of the most common forms of adaptation that participants discussed was flood drainage infrastructure (e.g. Figure 5a). Five participants explained that a significant amount of local government money had been invested into installing flood drains but that they were poorly designed, infrequently maintained, and as a result ineffectual: 'It doesn't work, simple as that. It was meant to help the flood issue in Lakes Entrance'.

Considerable frustration was expressed about the significant cost incurred in installing and maintaining the flood drainage infrastructure. Some participants indicated that the drains are maladaptive because they thought the drains increased, rather than decreased, the vulnerability of properties and houses to flooding. Many participants showed photos of blocked drainage infrastructure (e.g. Figure 5a). Participants

also commented on how the drainage infrastructure was 'ugly'.

Figure 5a P: Yeah. And here are the two pipes that drain the creek water out into the lake ... No comment! [guffaw].

I: 'No comment?' No, go on!

P: Look at it! It's all choked with sand. Water couldn't flow out anyway ... even if it flooded, it's just going to backfill in the lake, and backfill into the creek, and flood all the houses along the creek.

The second major form of 'accommodation' adaptation that participants discussed was dredging of The Entrance – the opening between the Gippsland Lakes system and the Pacific Ocean. Nine participants took photos of the trailing suction hopper dredge boat 'The Pelican'. Most of the participants that discussed the dredge believed that 'it's been working reasonably well'. Evidence of its effectiveness was believed to have been provided in June 2012 when the last predicted floods did not eventuate:

... a lot of people say that 'The Pelican' dredge does aid in the flood mitigation because it allows the river waters, if all the rivers are in flood, I think there are seven rivers that flow into the lake system, if the dredge hollows out the opening, that water can release more effectively, therefore not flooding the town.

The final form of accommodation that was photographed and discussed by participants was planning restrictions, particularly the requirement to accommodate future sea-level rise projections. Participants took photos of private and business properties that were being rebuilt in line with new building requirements (e.g. Figure 5b,c). Other participants talked of private properties or community facilities for which renovations had been planned but not implemented, due to the costs of meeting the new planning regulations. Unlike the other forms of accommodation, no participants discussed the positive effects of the building regulations on the things they value about Lakes Entrance. The direct negative impacts mentioned included emotional distress, the restriction of private property rights, prolongation of the planning approval process, and increased financial burdens for those who wished to make changes to their properties.

Figure 5b P: I went and I saw the site manager and said to him, why I was taking the photographs and he said to me, 'Well,' he said, 'you know, they have had to build a ramp ... and it cost \$50,000 more to build that shop' ... And I said to him, 'Do you think it's going to stop retailers?' and he said, 'It will certainly make them wary of Lakes [Entrance]



Figure 5 Participant photos (refer to text for full description and accompanying quotes): (a) blocked creek drains, (b) building to accommodate potential flooding costs more, (c) building our house 2.4 m above high tide, (d) 'This big, ugly eyesore'

I: Okay. Where is this building site?

R: This is a new one, just before you get to the footbridge. There's four [units in the building plot], but this is the first one and the others are holding back.

I: Okay. Why is that?

R: To see what it costs and to see what it's going to look like. Yeah.

Figure 5c There was an old cabin there that ... had been flooded a couple of times over the years, [it] was actually lower than the road level. But now, they battled the council to build a new place and every time they put forwards plans, architect's drawings, the council moved the goalposts. So now they are up to ... 4 metres above high tide mark. But it gives you an idea of how high the floor level is going to be ... It [the regulation] is just totally overkill.

Participants were concerned that the new planning regulations discouraged (re-)development, which in turn could affect the tourist industry. It also affected community activities because facilities, such as churches, were unable to be developed and improved. Last, it impacted individuals and families: one participant (Figure 5c) said it took five years to get planning approval for alterations to their property, which took an emotional toll on the extended family. The building regulations elicited the greatest emotional responses

of all the accommodation adaptation options. While flood infrastructure and dredging elicited frustration when it did not work, building regulations were seen to be highly unfair because projects that would have been approved in the recent past were no longer being approved.

Only four people took photos of hard coastal protection, specifically the groynes at The Entrance. None of these participants took these photos with flood management in mind, rather they were concerned with its function to keep the channel open, prevent erosion, and even as a habitat for mussels. When asked whether groynes were seen to be a potential option for adapting to sea-level rise, some respondents believed that groynes would be ineffectual and would only provide a 'band aid' solution, although others believed that groynes could help to protect properties:

Lakes Entrance has to change its, not so much attitude but it's atmosphere a bit and become more of a lakeside type township and what I mean by that, relying more on jetties and beaches and groynes and all those bits of infrastructure ... whether it's sea walls or whether it's raised embankments and things. I think they are going to have to get used to that.

A small number of people mentioned sea walls. Three respondents were in favour of sea walls, with

two suggesting Lakes Entrance should learn from other places:

There's lot of things to learn from the Dutch ... And there's lots of other places in the world who have got systems that cater for high tides and flooding. We are not unique that we have got to think up our own system; we just go and pinch other people's ideas! [Laughter].

Concern was expressed that a sea wall would detract from the amenity of Lakes Entrance and negatively impact on the natural environment:

They are going to fight to have, you know, a wall or a barricade and it's going to change the feel of the place completely but it's either something like that or you just have to, you know, patch up and hope it doesn't go too far under.

The most heated comments of all the photo-elicitation interviews occurred when participants discussed adaptation decisionmaking around flood risk. Some participants were critical of the uncertainty associated with building regulations in recent years, and that the uncertainty around building regulations was just as problematic as the planning decisions themselves. Other participants were frank about what they perceived as a lack of leadership from key decisionmakers, particularly in the context of future legal challenges; or a lack of consultation between themselves (as locals with long periods of expert knowledge of their environment) and the decisionmaking process (perceived as conducted at a distance – as one participant put it, by 'some moron in a suit in the city', i.e. in the distant state capital, Melbourne).

Figure 5d This place, and the one on the corner, have been like this for years because of all the Shire, sort of, and the Government, I don't know who, I think mostly the Shire, waiting to see because they are concerned about the town flooding, what the building regulations are going to be ... there is just this big, ugly, eyesore right on the corner of the main intersection.

I: How do these photos make you feel about the future?

P: Erm, probably more angry than anything else. The way they go about things and they don't ask the local people. It's all the pen pushers; the academics; what should be done ... the council, sort of, listens to the locals but I don't think the government listen to the locals because it is all about dollars.

I believe the council are scared about litigation, they don't want to be held liable for flooded houses if sea level does rise, so they are taking the stance which is work on the worst-case scenario or make the regulations just in case. These blokes [surveying the road], should have been measuring the bloody tide ... That's my house just there and it

never comes up higher than halfway across that road, in the 30 something years I've been there ... Somebody from the city sat there and drew the line up [a particular road], said, 'That side can't build. This side I can build.' And it's totally incongruous because it's upside down with the sea levels

One participant summed up the difficulties faced by decision makers, commenting: 'I am not picking on the council, but it just highlights how we try to do things but in reality we are still stumbling, not really getting very far'.

Discussion

In Lakes Entrance place attachments that are threatened by flooding, and adaptation to flood risk, include the personal and communal identities associated with the tourism and fishing industries; the sense of belonging from living and re-living family connections to local places; the sense of community that comes from living in a semi-rural coastal settlement; and enjoyment derived from diverse recreational activities. Participants' accounts revealed that they are already preparing for sea-level rise in their choice of where to purchase houses. With respect to government-led adaptation, participants were supportive of dredging of Lakes Entrance, showed mixed support for groynes and sea walls, were unconvinced about the effectiveness of existing drainage infrastructure, had scarcely considered retreat, and were most critical of planning restrictions, which they believe need to better accommodate current social practices.

While these findings are largely consistent with those of the overarching University of Melbourne project (Barnett *et al.* 2014), there were two considerable benefits to using photo-elicitation over interviews, focus groups and questionnaires (this adds to the debate on performance, representation and research methods; cf. Latham 2003; Hitchings 2012). First, photo-elicitation provided visual evidence and verbal narratives of the *physical* and *social* dimensions of places that participants are attached to in and around Lakes Entrance. It revealed the ways in which flood management intersects with participants' everyday lives, and the associated *affective*, *behavioural* and *cognitive* ramifications of flood events on place attachment. Second, participants used the method as an opportunity to illustrate their own interpretations of the challenges posed by flooding, sea-level rise and adaptation. In doing so, they took ownership of the issue and advocated for adaptation options that aligned with their own aspirations and visions for the town. The discussion that follows examines the implications of these dual outcomes of the photo-elicitation approach for informing more locally acceptable climate adaptation outcomes in Lakes Entrance and other semi-rural coastal settlements.

Photo-elicitation as a window onto flooding-place attachment nexus

Participants' place attachments were interwoven between both physical and social environments, including attachments to the climate of the town, a fundamental physical attribute. Photos of physical places were accompanied by narratives of social activities, and revealed how local places are imbued with meaning. For example, one participant described her recent retirement to a house in Lakes Entrance; and the things she valued (the building itself, the view from her veranda, the clean air and the social networks) about living there. Such accounts are consistent with past photo-elicitation studies of residents' place attachment, which have found that physical and social dimensions of place are inextricably linked in photo descriptions (e.g. Stedman *et al.* 2004).

The photo-elicitation method also provided insights into the cognitive, affective and behavioural dimensions of person-place bonds, and the way in which flooding and concerns about sea-level rise permeate all three. This is significant given that past climate change studies focusing on place attachment have only considered one of these three dimensions (e.g. Scannell and Gifford 2011 and Willox *et al.* 2012 focused on cognitive and affective bonds, respectively). Cognitive dimensions were demonstrated by participants' insights and knowledge of landscape: from the description of how flooding impacts the ecology of the town golf course, to the explanation of a past photo of historic flood events at a local park. Affective dimensions of place attachment were articulated through one participant's description of her family's ritual meditative coastal walk to watch marine wildlife; and another's description of her family's boatyard as being 'in my blood'. Participants discussed behavioural dimensions to their place attachment, such as the participant who 'mortgaged everything' to get his cherished lakeside block of land, demonstrating proximity-maintaining behaviour in the face of tough economic circumstances. Such accounts suggest the importance of considering all three dimensions of place attachment, the centrality of climate and climatic events to such human experiences (as per Hulme 2015), and the utility of photo-elicitation for revealing them.

The photo-elicitation method was also effective at elucidating place attachment across timescales, reaching back into the past, and into the future. For example, many participants declared a long-term connection to place, either through their ancestral link to early settlers, or through a lifetime of vacations to the area resulting in retirement there. Likewise, many participants had much to say on how the future of Lakes Entrance should be managed to protect currently valued

entities. Parsons and Nalau (2016, 88) demonstrate, using the transformation of Aotearoa New Zealand from predominately woodlands into farmlands as an example, how purposeful transformation occurs primarily through the driver of a 'collective preoccupation, a shared vision, of what the future could or should be like'. Thus the photo-elicitation method is not only useful for understanding past events (Harper 2002) but also provide an opportunity to explore how adaptation to sea-level rise may take place in the future.

Photo-elicitation may have a number of practical benefits for researching place attachment. The photograph-taking exercise, spread over a week, and the subsequent in-depth exploratory interviews, enabled participants to reflect on what might otherwise be taken-for-granted aspects of daily life (this echoes other kinds of participatory research, such as 'talking whilst walking'; Anderson 2004). As such the process enabled participants to reveal and perform their own realities of place attachment; it allowed a 'different way in' (Guillemin and Drew 2010) to the research process, providing powerful prompts for participants to gather their thoughts and articulate deeply held values. It enabled the research to 'get at' the practical, embodied, non-cognitive and often non-verbal routines involved in 'making place[s]' (Latham 2003; 2001). As Harper (2002, 23) describes, only photography can capture a thought at a particular moment: 'that extraordinary sense of seeming to retrieve something that has disappeared belongs alone to the photograph, and it leads to deep and interesting talk'.

Compared with the more conventional social science methods, such as interviews and questionnaires used in the University of Melbourne project (Barnett *et al.* 2014), photo-elicitation provided a visual documentary of the places, and associated social values at risk, of flooding and sea-level rise. For example, in the University of Melbourne project interviews were used to understand the potential impacts of flooding on everyday practices by asking participants about weekday and weekend activities and whether flooding affected residents' ability to enjoy the places they spent time in. Participants listed a range of activities that they participated in, but often downplayed the significance of flooding to their daily activities (Fincher *et al.* 2015); floods were mostly seen as occasional and fleeting. In contrast, the photo-elicitation study enabled participants the time to document their daily activities through photos and reflect on the way in which flood events and flood management really permeated their daily lives. Photo-elicitation participants were much more likely to discuss the impacts of flooding on their recreational activities than those in the semi-structured interviews who mostly

focused on the impacts to homes, businesses and roads. Thus the photo-elicitation method provided a far more comprehensive perspective on the physical and social dimensions of place attachment that were affected by flooding.

In addition to providing a different account of flooding in Lakes Entrance, the photo-elicitation study provided researchers with a greater appreciation of the physical places, and associated social dimensions, that are affected by flooding and may be affected by sea-level rise. The participants' intimate knowledge of the local area meant that photos were taken of less visible flood infrastructure as well as photos of flood events that occurred before and after the researchers had visited Lakes Entrance. This enabled researchers to come to a better understanding of the ways in which flooding influences everyday lives in Lakes Entrance, and demonstrates how photos can facilitate a common understanding among both parties involved in the research (Harper 2002).

Nevertheless, there are a number of disadvantages of the photo-elicitation method. A number of these are practical considerations: for example, additional time is needed to organise and analyse visual as well as textual data; and digital storage of large quantities of visual data must be attended to. There are a number of ethical considerations – confidentiality and copyright issues must be sensitively handled. And there are potential limitations to the method itself: the photographic collection of each participant has been 'curated' to a particular end (with perhaps unflattering photos removed), and as such, illuminating photos may have been withdrawn from the pool to be discussed at interview; or Harper's (2002, 23) comment of photographs generating 'rich and complex talk' means that the focus in analysis returns to the talk at the expense of the visuals (Rose 2012). More broadly, visual research may suffer somewhat in achieving legitimacy – both within and beyond the academy. This may manifest in struggling to recruit researchers expert in visual methods (talk and text methods training is standard, visuals training is not); or, difficulties in persuading policymakers that photo-elicitation is a viable and useful research method (see Wiersma 2016). These are not insurmountable problems [researchers should look to the use of PhotoVoice in Development Studies and in Public Health; e.g. STEPS Centre (2014); Wang and Burris (1997), to see how photo-methods can usefully engage all stakeholders, for example; and Rose (2012) usefully addresses many of the other issues raised here), but researchers should be aware of potential pitfalls and disadvantages of photo-elicitation before using such a method to explore the flooding-place attachment nexus.

Photo-elicitation as an avenue for shaping place-based adaptation

The photo-elicitation process not only allowed participants to be 'proxy-observers' (Zimmerman and Wieder 1977), it also allowed them to become 'proxy-researchers'. The opportunity to take photos over a week enabled participants to gather evidence to illustrate their views and arguments. For example, a number of participants took photos of the same places at different times of the day, week or tide to demonstrate their concern for the places of value to them and to construct a narrative. Beyond this, a number of the participants used the photo-elicitation method to bring to life the real-world impacts of flooding, sea-level rise, and adaptation. This occurred through the introduction of previous personal photographs to the interview, the creation of evocative captions to accompany the photos, and the undertaking of impromptu interviews and ethnographic-type activities.

Some participants went beyond the photo project brief. Not only did they take photos of their everyday activities during the study period, but they also displayed photos in the interview that they had previously taken. These photos included places, people and activities of significance to them. Some of these photos included evidence of prior flooding. Participants used these photos to add further weight to their explanations about the impact that flooding has, and sea-level rise may have, on their lives and the imperative to take action to protect these things of value. These additional photos provided participants with greater control and flexibility over the topics covered in the interviews, and demonstrated a desire to help researchers get a more complete understanding of their interpretation of the issue of flooding, sea-level rise and adaptation. Such spontaneous and enthusiastic re-working of the method suggests how photo-elicitation can give participants more power over the research process, to provide evidence and share expertise and knowledge (Wang and Burris 1997). This speaks to wider academic debates about ensuring greater participation in the development of adaptation policy and plans (i.e. in defining the problem), as well as any eventual policy implementation (Burton and Mustelin 2013). We know of no other photo-elicitation studies that have reported similar re-workings of the research process.

Some participants not only provided descriptions of their photos during the interviews, but prior to the interviews had invested effort into developing captions to describe the images. While other photo-elicitation projects encourage participants to develop captions for photographs taken (e.g. Baldwin and Chandler 2010), this study did not. By providing captions, the participants brought visual and textual data even closer together; participants were not only photo takers but also photo analysts. Thus photo-elicitation is not only useful

as an innovative method of primary data collection (Baldwin and Chandler 2010) but also stimulates data analysis (Beilin 2005). Participants took photos and created captions to convey a particular person–place bond and frame flooding and sea-level rise in a particular way.

Finally, one participant took the initiative of visiting a local building site, conducting an informal interview with the site foreman, and taking a detailed photo-ethnography of building under sea-level rise planning conditions (see Figure 5b). This provides further evidence of how photo-elicitation can be empowering from a research perspective; it is a process that can be used to enable stakeholders to act as catalysts for change (Wang and Burris 1997) and take some control over their destinies as part of the recognition of identity and place (Adger *et al.* 2011).

Conclusion

This research demonstrates how the concept of place attachment can be used to reveal the biophysical and social impacts of climate change as well as the impacts that arise from the decisionmaking processes designed to adapt to these impacts. In particular, the three dimensions of place attachment – person, place, and psychological process of engagement – that have previously been elaborated in the literature, and the way these evolve over time, provide a useful framework for understanding the nuances in the material and non-material impacts of flooding, sea-level rise and adaptation.

Participants not only discussed the impacts on their own and others' place attachment, as individuals, but also the groups that they belong to: family, friendship, neighbourhood, wider community. With respect to the place dimension, participants provided examples that demonstrated how their physical and social attachments to Lakes Entrance and surrounds, currently and may continue to be impacted by flooding and adaptation policies. They talked about these attachments at a range of scales, and across temporal epochs. Finally, they not only revealed the cognitive, affective, and behavioural ties that they have to Lakes Entrance, but how each of these are intimately intertwined and will be affected by environmental and policy changes. Understanding how these multiple dimensions of place attachment are perceived to be affected by flooding and adaptation provides evidence of the trade-offs, limits, and barriers that exist for different adaptation options. Incorporating such knowledge into adaptation decisions is essential if adaptation is to be effective, legitimate and equitable.

Beyond providing information on place attachment, the photo-elicitation method was used by participants to express their own reservations about the current adaptation process; photos provided an effective mechanism for challenging popular and policy accounts of

the future with present everyday realities in Lakes Entrance. This demonstrates how the strong tradition of photo-methods as an action-research methodology may be usefully extended to climate change adaptation. It is an important method to add to the suite of values-based approaches to adaptation; not only does photo-elicitation provide insights into person–place bonds at risk but directly addresses questions of fairness by providing a mechanism for involving local communities in adaptation discussions.

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References

- ABS** 2011 *2033.0.55.001 Census of population and housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2011* Australian Bureau of Statistics, Canberra
- Adger W N and Barnett J** 2009 Four reasons for concern about adaptation to climate change *Environment and Planning A* 41 2800–5
- Adger W N, Barnett J, Chapin F S III and Ellemor H** 2011 This must be the place: under representation of identity and meaning in climate change decision-making *Global Environmental Politics* 11 1–25
- Anderson J** 2004 Talking whilst walking: a geographical archaeology of knowledge *Area* 36 254–61
- Arrowsmith C and Race G** 2014 Spatial assessment of estuary shoreline erosion susceptibility in *Hydrology and Water Resources Symposium 2014* Engineers Australia, Barton, ACT 621–8
- Baldwin C and Chandler L** 2010 'At the water's edge': community voices on climate change *Local Environment* 15 637–49
- Barnett J, Fincher R, Hurlimann A, Graham S and Mortreux C** 2014 *Equitable local outcomes in adaptation to sea-level rise – final project report* University of Melbourne, Melbourne
- Beilin R** 2005 Photo-elicitation and the agricultural landscape: 'seeing' and 'telling' about farming, community and place *Visual Studies* 20 56–68
- Brace B and Geoghegan H** 2011 Human geographies of climate change: landscape, temporality, and lay knowledges *Progress in Human Geography* 35 284–302

- Brown B and Perkins D** 1992 Disruptions in place attachment in **Altman I and Low S** eds *Place attachment* Plenum, New York 279–304
- Burley D, Jenkins P, Laska S and Davis T** 2007 Place attachment and environmental change in coastal Louisiana *Organization and Environment* 20 347–66
- Burton P and Mustelin J** 2013 Planning for climate change: is greater public participation the key to success? *Urban Policy and Research*. DOI:10.1080/08111146.2013.778196
- Casey E S** 2001 Between geography and philosophy: what does it mean to be in the place world? *Annals of the Association of American Geographers* 91 683–93
- Clark-Ibáñez M** 2004 Framing the social world with photo-elicitation interviews *American Behavioural Scientist* 47 1507–27
- Davenport M A and Anderson D H** 2005 Getting from sense of place to place-based management: an interpretive investigation of place meanings and perceptions of landscape change *Society and Natural Resources* 18 625–41
- DCC** 2009 *Climate change risks to Australia's coast* Department of Climate Change, Canberra
- Devine-Wright P** 2013 Think global, act local? The relevance of place attachments and place identities in a climate changed world *Global Environmental Change* 23 61–9
- Fincher R, Barnett J and Graham S** 2015 Temporalities in adaptation to sea-level rise *Annals of the Association of American Geographers* 105 263–73
- Ford J D, Keskitalo E C H, Smith T, Pearce T, Berrang-Ford L, Duerden F and Smit B** 2010 Case study and analogue methodologies in climate change vulnerability research *WIREs Climate Change* 1 374–92
- Fresque-Baxter J A and Armitage D** 2012 Place identity and climate change adaptation: a synthesis and framework for understanding *WIREs Climate Change* 3 251–66
- Geoghegan H and Leyshon C** 2012 On climate change and cultural geography: farming on the Lizard Peninsula, Cornwall, UK *Climatic Change* 113 55–66
- Graham S, Barnett J, Fincher R, Hurlimann A, Mortreux C and Waters E** 2013 The social values at risk from sea-level rise *Environmental Impact Assessment Review* 41 45–52
- Guillemin M and Drew S** 2010 Questions of process in participant-generated visual methodology *Visual Studies* 25 175–88
- Gustafson K and Al-Sumait F** 2009 *Photo conversations about climate* University of Washington, Seattle.
- Harper D** 2002 Talking about pictures: a case for photo elicitation *Visual Studies* 17 13–26
- Harvey D** 2001 *Spaces of capital: towards a critical geography* Routledge, London.
- Hess J J, Malilay J N and Parkinson A J** 2008 Climate change: the importance of place *American Journal of Preventative Medicine* 35 468–78
- Hidalgo M C and Hernández B** 2001 Place attachment: conceptual and empirical questions *Journal of Environmental Psychology* 21 273–81
- Hitchings R** 2012 People can talk about their practices *Area* 44 61–7
- Hulme M** 2015 Climate and its changes: a cultural appraisal *Geo: Geography and Environment*. DOI:10.1002/geo2.5
- Hurlimann A, Barnett J, Fincher R, Osbaldiston N, Mortreux C and Graham S** 2014 Urban planning and sustainable adaptation to sea-level rise *Landscape and Urban Planning* 126 84–93
- Karlsson M, van Oort B and Romstad B** 2015 What we have lost and cannot become: societal outcomes of coastal erosion in southern Belize *Ecology and Society* 20 4
- Lane S N, Odoni N, Landström C, Whatmore S J, Ward N and Bradley S** 2011 Doing flood risk science differently: an experiment in radical scientific method *Transactions of the Institute of British Geographers* 36 15–36
- Latham A** 2003 Research, performance, and doing human geography: some reflections on the diary-photograph, diary-interview method *Environment and Planning A* 35 1993–2017
- Lewicka M** 2011 Place attachment: how far have we come in the last 40 years? *Journal of Environmental Psychology* 31 207–30
- Lombard M** 2013 Using auto-photography to understand place: reflections from research in urban informal settlements in Mexico *Area* 4 23–32
- Lyth A, Harwood A, Hobday A J and McDonald J** 2015 Place influences in framing and understanding climate change adaptation challenges *Local Environment*. DOI:10.1080/13549839.2015.1015974
- Massey D** 2005 *For space* Sage, London
- Mortreux C and Barnett J** 2009 Climate change, migration and adaptation in Funafuti, Tuvalu *Global Environmental Change* 19 105–12
- Moser S C and Boykoff M T** eds 2013 *Successful adaptation to climate change: linking science and practice in a rapidly changing world* Routledge, London
- O'Brien K L, Eriksen S, Sygna L and Naess L O** 2006 Questioning complacency: climate change impacts, vulnerability, and adaptation in Norway *AMBIO* 35 50–6
- Parsons M and Nalau J** 2016 Historical analogies as tools in understanding transformation *Global Environmental Change* 38 82–96
- Raymond C M and Brown G** 2011 Assessing spatial associations between perceptions of landscape value and climate change risk for use in climate change planning *Climatic Change* 104 653–78
- Rose G** 2012 *Visual methodologies: an introduction to researching with visual materials* 3rd edition Sage, London
- Scannell L and Gifford R** 2010 Defining place attachment: a tripartite organising framework *Journal of Environmental Psychology* 30 1–0
- Scannell L and Gifford R** 2013 Personally relevant climate change: the role of place attachment and local versus global message framing in engagement *Environment and Behavior* 45 60–85
- Stedman R, Beckley T M, Wallace S and Ambard M** 2004 A picture and 1000 words: using resident-employed photography to understand attachment to high amenity places *Journal of Leisure Research* 36 580–606
- STEPS Centre** 2014 *Photovoice* Institute of Development Studies University of Sussex, UK .http://steps-centre.org/methods/pathways-methods/vignettes/photovoice/) Accessed 29 April 2015
- Tuan Y-F** 1977 *Space and place: the perspective of experience* University of Minnesota Press, Minneapolis, MN
- VCC** 2013 *Draft Victorian coastal strategy* Victorian Coastal Council, Melbourne

- Wang C and Burris M A** 1997 Photovoice: concept, methodology, and use for participatory needs assessment *Health Education & Behavior* 24 369–87
- Wiersma B** 2016 Public acceptability of offshore renewable energy in Guernsey: using visual methods to investigate local energy deliberations PhD thesis, University of Exeter, UK
- Wilcox A C, Harper S L, Ford J D, Landman K, Houle K and Edge V L** 2012 From this place and of this place: climate change, sense of place, and health in Nunatsiavut, Canada *Social Science & Medicine* 75 538–47
- Zimmerman D and Wieder D** 1977 The diary: diary interview method *Urban Life* 5 479–98