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Temporalities in adaptation to sea-level rise

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Abstract

Local residents, businesspeople and policy-makers engaged in climate change adaptation often think differently of the time available for action. Their understandings of time, and their practices that invoke time, form the complex and sometimes conflicting temporalities of adaptation to environmental change. They link the conditions of the past to those of the present and the future in a variety of ways, and their contemporary practices rest on such linking explicitly or implicitly. Yet the temporal connections between the present and distant future of places are under-theorized and poorly considered in the science and policy of adaptation to environmental change. In this paper we address this theoretical and practical challenge by weaving together arguments from social and environmental geography with evidence from small coastal communities in south-eastern Australia. We show that the past conditions residents' imagined futures, and that these local, imagined futures are incongruent with scientific, popular, and policy accounts of the future. Thus we argue that the temporalities of adaptation include incommensurate and unacknowledged ways of knowing, and that these affect adaptation practices. We propose that strategies devised by governments for adapting to environmental change need to make visible - and calibrate policies with - the diverse temporalities of adaptation. On this basis the times between the present and the long-term future can be better navigated as a series of short and negotiated policy-steps.

Key Words: adaptation, coast, climate change, policy, sea-level rise, time, temporalities

Introduction

Climate change is expected to alter ways of life in places, and planning for these futures is a troubling prospect for scientists adept at conceptualizing sociospatial processes in the present (Hulme 2010; Swyngedouw 2010; Nielsen and Sejersen 2012). The prospect of changed environments in the future challenges researchers to provide theories of the relationship between the present and the future that can inform adaptation decisions. In this article we address this challenge, drawing on geographic literature about time in places, and on evidence collected in small coastal communities in south-eastern Australia. We argue that there are diverse temporalities associated with adapting to climate change, and that revealing and reconciling these is necessary to manage risks as they unfold over time. We show how the temporalities relevant to places imply different sets of expectations of and practices for managing the future, and that there can be different, even conflicting, temporalities co-existing within the thinking and practices associated with a place. Our findings are in keeping with recent geographical research that shows that expert and local knowledge may have different temporalities, requiring innovative responses to managing change (Brace and Geoghehan 2011; Lane et al. 2011, 2013).

Sea-level rise is a major theme in the scientific and popular representations of the dangers of climate change (Farbotko 2010a). It poses risks to the lived values of 600 million people and two-thirds of the world's major cities that are located in low-lying coastal areas (McGranahan, Balk, and Anderson 2007), yet in most places these risks are unlikely to materialize for decades. Under most scenarios sea levels are expected to rise incrementally for the next twenty-five years or so, and then rise more rapidly to between twenty-six and eighty-two centimetres by the end of the century (IPCC 2013). There are few easy options for adapting to these projected rises in sea level (Moser, Williams, and Boesch 2012).

Local governments in the region of Gippsland East on the southeast coast of Australia are being required by their State Government to plan for sea-level rise of between 0.2 and 0.8 meters by the years 2040 and 2100, respectively (Victorian Government 2013). In a three-year-long study in five small

communities in this region (Figure 1) in partnership with local and State government organizations, we have been working to identify socially equitable ways of adapting to future sea-level rise. Here, most homes and infrastructure are located within two meters of current mean sea level. Coastal flooding, which inundates roads, jetties, homes, and businesses, is experienced when king tides and strong winds coincide (DCC 2009). The median age of the population is considerably older than the State and Australian medians, and median weekly household incomes are considerably lower than the Australian median (Table 1). In this paper, we focus on the temporalities associated with these places, and the importance of revealing them as pivotal for different participants in decisions about the future there.

Table 1. Socio-demographic information for the five study sites in Gippsland East. Source for population data: ABS (2011).

Towns	Population	Median household income (weekly)	Median age		Number of people per household	
			Population	Interview sample	Population	Interview sample
Lakes Entrance	5,020	$694	49	42	2.2	2.8
Port Albert	247	$608	57	49.5	1.9	2.3
Seaspray	316	$933	48	62	2.4	2.4
McLoughlins Beach *	255	$773	51	60	2.2	2
Manns Beach *		$635	53	62	2.1	3
Australia	**23,156,138**	**$1234**	**37**		**2.6**	

* McLoughlins Beach and Manns Beach are contained within larger collection districts and therefore the numbers presented here may not accurately reflect the populations of these small communities.

Between November 2010 and April 2013 multiple methods were used to understand how local residents, second home owners and policy actors view the past, present and future of the five communities. A detailed explanation of the full suite of methods is provided in Barnett et al. (2014). The data presented here were generated using four methods from this suite. (1) Semi-structured interviews were conducted with forty-two residents and second home owners. Questions were asked about the history of their connection to their town, their ongoing links to the place and people, if and how they would like the place to be different, and their experiences of coastal flooding. The questions were designed

with reference to past research on community responses to environmental change (specifically Stolp et al. 2002; Measham 2003; Brown, Lloyd, and Murray 2006; Waters et al. 2010). (2) Eight focus groups were conducted with forty-nine residents who had previously participated in the research, to gauge local reactions to alternative policy frameworks for responding to sea-level rise. (3) Semi-structured interviews with thirty policy actors, working at national, State, regional and local levels of government, were conducted to ascertain how their organizations are involved in decision-making about climate change adaptation in Gippsland East and their perspectives on past, current and future policy options. (4) A day-long workshop with researchers and regional and local policy-makers was used to explore the possibilities for timing future decisions about adapting to climate change, particularly sea-level rise. Data collected from the use of these four methods were audio recorded, transcribed, and thematically analyzed. Using these data, we offer grounded theorizations of the various temporalities associated with adaptive responses to an anticipated future of sea-level rise in this region.

The many times involved in responding to climate change

The numerous temporalities associated with the coastal places of Gippsland East, drawn from interviewees' comments about those places, can be understood as interplays between the past, the present, and the future. The spatial scale of our analysis, its point of focus, is the locality, where there are many times operating in the local practice and interpretation of the everyday. In observing the everyday, where "there is no single time but a variety of times" (Urry 2009, 180), we do not assume that people bend their own local knowledge to take in expert scientific opinion formed at larger scales. Rather, we recognize, as Lane and colleagues (2011, 2013) and Robin (2012) show, that local knowledges are valuable, diverse, and have different temporalities and other features which may cause them to conflict with 'expert' knowledge.

We note that the spatial and temporal scale of our analysis differs from most contemporary analyses of climate change, which focus on national and planetary scales, and on immense temporal scales (Nielsen and Sejersen 2012; O'Brien and

Barnett 2013). These large spatial and temporal scales appear in much literature conceptualizing the significance of time for social life. For example, studies of "Western capitalist modernity" indicate that "society" is experiencing certain patterns of acceleration (Rosa and Scheuerman 2009; Crang 2010). Analysis of such meta-timing includes the economic and social "time-space compression" made familiar by Harvey (1990, 1996). These perspectives indicate that populations are embedded in epochal changes of major structural significance, yet there is little attention paid to any disconnect between these immense temporal and spatial scales and everyday life, or indeed to how we might enable our analyses to see any such variation within the broad patterns delineated. Demonstrating the scaling up of local times, or the scaling down of the temporalities of epochs, is not our task in this paper. We note that it is an important task, however, even as we focus our attentions on the varied temporalities of the local and the everyday.

How pasts influence presents

Geographic exploration of time-space has long explained how the *when* of a local place is as important as the *where* of it (Hagerstrand 1970; Thrift 2000; Whitehead 2005; Taylor 2009). This research has taken different forms. Each of those forms of examining the local has made visible new links between pasts and presents. So, Hagerstrand's (1970) pioneering work on the time-space prisms through which individuals' lives are enacted—highlighting the role of schedule in the activities of a day or week—showed how the accreted past in the form of temporal and spatial constraints shapes life in daily practice in a place. Viewing time differently, feminist analysis has revealed the temporality of caring. It has recognized how the relentless clock time of the workplace is generally less defining in caring work (Tronto 2003). Caring is an ever-present task, always there and often invisible because its timing is unregulated and therefore it is unnoticed. This characteristic of the timing of caring is as familiar in the present as it was in distant pasts.

Other studies of local environmental cultures have shown that looking back to the past experiences of one's community, over the intergenerational timescale of

known lifetimes, may give rise to continuity with those past practices, in the present. For example, focusing on the dryland farming communities of the Mallee region in southeastern Australia, Anderson (2008, 68) finds that drought, a persistent feature, defines the way of life of rural communities, and "can be viewed as a cultural term whose primary connotations are less related to rainfall than to an overarching, mythic narrative of endurance". The imagining of present-day lives in places, by those living there and familiar with the places, often draws on the past.

The philosopher Elizabeth Grosz (2004, 251) explains the interactions between past, present, and future thus: "Every present is driven by memory… equally, the present always spreads itself out to the imminent future, that future a moment ahead for which the present prepares itself by reactivating the past in its most immediate and active forms, as habit, recognition, understanding". Futures, then, are framed by past-influenced presents. In considering long-term futures in places, both dwellers in those places and policy-makers bring to their thinking their linking of past and present. Because the pasts and presents of all those involved in framing futures will not be the same, the temporalities they see and enact will not necessarily cohere.

In our empirical research in Gippsland East, we found (like Anderson 2008) that residents of small settlements deemed vulnerable to sea-level rise drew parallels between their present-day experiences of flooding due to tidal and riverine events, and their families' past experiences of flooding. They built their environmental knowledge on the basis of known family and community histories, and made clear their understanding of the similarities between these experiences in the past, present and future. They drew on the past to explain their own presents, and the continuities they foresaw for their futures. For example:

> [Flooding is] something that's been happening here - families have been around here for years and it was happening when our grandfathers were here. The same, when the king tides and the rivers got a lot of rain, it was happening way back then.

In a focus group, when one person agreed that flooding affected her home quite frequently, saying 'Yeah we can't get out, certainly not with the motorbike, so we're blocked in for a few days', the significance of her view was countered by another who said that this situation has long been happening (and therefore should be seen as something that is coped with, as needed).

> But that's been going on … we used to come as kids and I mean there were lots of times when we'd go oh we've got to leave before the tide comes in because we won't be able to get around it. I think you don't move down here without expecting it.

Well-functioning drains are seen as the way to combat inundation in these small, low-lying settlements and as the frontline for dealing with flooding of greater frequency if that should occur. 'As long as the drains are maintained and things are maintained, it [the flood water] just runs away. You know, it's been doing that for millennia' was a comment in another focus group.

To be clear, our point here is not to romanticize or valorize these statements of knowledge as records of environmental change (on this issue see, for example, Griffiths and Robin 1997). Rather, our point is to show how *futures* are anticipated in terms of pasts, in this case as involving continued and successful coping with flooding. The temporal scale of the life-time and the coping of families and ancestors with environmental vagaries exceed in significance the occasional everyday difficulties of flooding, even when occasional flooding is expected to increase in frequency. And local residents *want* the future to be like their past and their present. Said one interviewee, part of a family long in the area:

> We're actually falling into the same kind of routine that his parents did … Knowing the place so well… knowing that there's a certain expectation it's going to be the same … So there's that non-changing thing about it that's quite nice and reassuring. … our children really like it too.

We emphasise that one important aspect of these local perspectives, which hold that flooding is to be expected and can be anticipated, is to view flooding as a

short-term inconvenience that can be managed. It is temporary; one can work out when it is going to occur and make preparations.

> You've got a fair indication by looking out at the tides with the wind and everything … So you say, well the weather's not going to be too good, we could have a high tide. If you've got to go into town, you go into town, get what you have to get and get home.
>
> [And] We were well warned that it was going to happen and when it floods... So I stayed on this side of the town and it was just over in a few nights in the end … we had to wait for the water to go down.

In this context, popular messages of permanent, climate driven catastrophe are incommensurable with local time-spaces, as is explained by one local leader:

> When they can look back on one hundred years of rainfall figures from their property passed down from their grandfather and their father and now on to them, and they hear a prime minister in a suit talking about catastrophic climate change, they're not inclined to believe them. They can just look at their own figures and say… it's always changing, things are different, we'll adapt, we'll manage…

In Gippsland East, as in many places, the past strongly conditions attitudes to environmental change (Whitmarsh 2008; Hulme et al. 2009; Myers et al. 2013). The urgency that many decision-makers express in making plans now for a future of higher sea levels and more frequent flooding is not shared by local residents. Perhaps these are communities living what Urry (2009) has termed "glacial time" which exists together with (or perhaps in reaction to) "speeded up" time, and which slows living down to "nature's speed". Indeed, there are many residents in these settlements who have retired from full-time work, or second home owners who are on vacation when in the region, and many do indeed regard their lives in these places as leisurely lives, describing their speed of living (in one interviewee's words) as "relaxed… pretty cruisey… there's not too much going on". But also, for many people amongst the aging population of this area, slowness is not merely a valued characteristic of their everyday lives, but a necessary one given aging and illness. For example, a man caring for his ill wife

describes their everyday lives as being about 'resting and recuperating' through slow routines. For another woman aging means routines slow down: 'I took Sid to the beach on Saturday... [it takes] about half an hour to an hour, now, because we're both getting old – the dog and me'. Numerous interviewees, even those who were not themselves elderly or ill, mentioned the special difficulties that environmental emergencies posed for much older residents:

> The drains, when we did have that flood, were so full of water that there was no footpath… The oldies would have to walk down the street.
>
> It could be devastating for the older people… we have quite a number of older people… they don't like to impose on other people and that would have a devastating effect on them because they wouldn't even really let us know how they were going.

We might conclude that a slower speed of living is at risk from rapid responses to anticipated sea-level rise in this place, as well as being at risk from sea-level rise itself, acknowledging that what is at risk includes values, life course characteristics, and psychosocial needs (Graham et al. 2013). An older population in a place, with all that advanced age implies in terms of limited mobility and greater experience of daily constraints, is particularly likely to wish for stability and to value a slower time for mutual caring.

So, in the accounts of residents of the small settlements of Gippsland East, places whose populations are of older median age than the national or State populations (Table 1), the temporalities of major relevance to coping with environmental change are the intergenerational (we will put up with this, as our families always have done) (cf Anderson 2008), and the daily (we will cope with flooding because we can manage on our own over periods of several days) (cf Hagerstrand 1970). Both temporalities are threaded through with the slower practices of caring, especially amongst the elderly population. Importantly, many residents make sense of their present-day lives with reference to their families' pasts in the area. Pasts are influencing presents, and they in turn influence interpretations of futures.

How presents frame futures

Recent scholarship is showing how the idea of future changes influences contemporary meanings and experiences of places. This is shown, for example, in the way projections of obesity and associated anticipatory policies make possible futures felt in the present (Evans 2009). Similar arguments about temporality have been made with respect to climate change, where practices aimed at managing future risks may pre-empt undesirable outcomes (Anderson 2010; Brace and Geoghegan 2011; Marino and Ribot 2012). In the case of climate change and small islands, social scientists have shown how the idea of "disappearing" islands undermines arguments for sustainable development (Barnett and Adger 2003), transforms popular representations of islands and islanders (Farbotko 2010b), and can manifest itself in local narratives about culture and the future (Rudiak-Gould 2012).

Somewhat like small islands, places along the Gippsland Coast, and in particular Lakes Entrance, are becoming icons for the problem of sea-level rise in Australia. To be sure, these are places that are low-lying, adjacent to a sandy coast, and on a lakes system that is well known for its environmental fluctuations, but they are hardly unique in this respect. What is unique is the intensity of research on climate impacts in the region. Since 2004 there have been six major studies investigating the effects of sea-level rise, changes in wind and waves, and subsidence, on sea-levels. Framing the future in sets of fixed, risk-laden points in time (2030 and 2070), these studies conclude that environmental change will cause: an increase of the one hundred year flood level at Lakes Entrance by between two and twenty centimetres in 2030 relative to present levels, and by between four and fifty-nine centimetres by 2070.

Such expert accounts of a distant and discontinuous future contrast strongly with the continuity anticipated by residents across their remembered pasts, lived presents and imagined futures. Lane et al. (2011, 2013) observe a similar contrast between expert and local knowledge in their work in a flood-prone British locality and community. This incongruity is enhanced by the way it abets a longstanding stigmatization of settlements in the region as economically and environmentally unsustainable places. The residents of Lakes Entrance and staff

working in local government offices feel this stigma. Two respondents in our study describe the State-wide reporting by media of a recent flood event:

> I was watching the news and they were talking about flooding in Lakes Entrance… they didn't mention that it was only a couple of puddles and they were doing the interview in Bairnsdale in front of the hotel there, the one right on the Mitchell River that floods every time.
>
> Well, down at the motel the bloke was kneeling in the water taking the photos so... instead of standing up, he was down low and it gave the impression the water was a lot higher than what it was. That was just irresponsible.

This led another respondent to conclude that the problem of flooding was not the fact of water in the town, but rather "the perceptions of the flooding, in the wider community and especially in the corridors of power".

Popularly-imagined futures for places can influence the way policy narratives frame those places. For example, in the words of the Australian Government's landmark report on sea-level rise, Gippsland East is "one of the most vulnerable coastal areas in Australia" (DCC 2009, 93). This view is not without material effects, for five of the six landmark decisions about planning for sea-level rise in the State of Victoria have related to the Gippsland East area (Macintosh 2012). In perhaps the most important of these decisions, one of the members of the Victorian Civil and Administrative Appeals Tribunal (VCAT) noted that "rising sea-levels are likely to and will have an influence on the future shape of the Victorian coastline".

Scientific, popular, and policy-based imaginaries of the future simultaneously constitute the present meaning of places. When places are seen as being imperiled, by actors in markets and policy communities, and their thinking informs decisions that impact on the present, then the present itself becomes vulnerable to ideas of the future.

Acting on anticipated futures can reify future dangers in lived presents (Anderson 2010). In Lakes Entrance, these ideas of the future materialize in the present in various ways. For local businesspeople futures are unambiguously seen through the lens of the viability of property and the possibilities of 'development'. The aforementioned VCAT decision, which led to a series of controls on commercial expansion (Macintosh 2012), is widely perceived by locals to have stifled development.

> [It] ruined all that investment. So unfortunately Lakes Entrance is becoming, along the Esplanade here, an area of dumps [deteriorated buildings]. People can't invest in it.

In housing markets, too, there appears to have been reduced activity. Local people see these effects manifested in various ways, including through falling property prices:

> People that I talk to in real estate… that have been holding onto property for development, they're all very disappointed, they're saying the property to developers was worth X amount, now it's probably worth a third of that.

Stigmatizing reporting by the media of flooding in Lakes Entrance impacts on local businesses:

> Like, on the news, don't come to Lakes, it's flooding... It was close to one of the school holidays and there was a lot of accommodation cancelled because of this "flooding".

Locals also believe that people in the low-lying parts of Lakes Entrance pay higher insurance premiums now due to the popular idea of Lakes Entrance as a flood-prone place:

> I had a vehicle crashed into the front of my shop. I had to put in an insurance claim for my signage and the window has to be replaced. All the paperwork keeps coming back: water damage, flood damage. … we keep saying, you've got it wrong, it wasn't a flood… I think it's just in people's minds that if there's a damage claim in Lakes Entrance, it must be floods.

Finally, local residents also suggest that local governments are now reluctant to invest in the infrastructure necessary for the orderly functioning of their communities for fear of losses arising from flooding and inundation.

> Local government and federal government and State governments, how they use the tool [of climate change predictions is] to really destroy community infrastructure. That's what's happening at the moment… [your local community] will not get anything now because in 2100 there's going to be .8 of a meter of sea-level rise.

Indeed, this view held by local residents is not without substance, as a policy actor suggests:

> The discussion about climate change affecting these communities means... in decision-making about infrastructure replacement there's always a two minute discussion about climate change and whether it's good value [to maintain infrastructure].

Future dangers are reified in material presents, and as Grosz (2004) makes clear, they are also inseparable from the interpretations of pasts that make their way into presents. But what is evident in this place is that the shaping of the future by governmental and media outsiders generates images of the future of this area that are unsympathetic to (or unaware of) the emphasis on continuities and of coping that many residents espouse. The absence of perspectives about continuities and coping from the publicized view of the future of their place makes some locals angry.

As the future unfolds in a distant time, the local residents who spoke to us in interviews and focus groups will make their futures in these places, using the habits and routines of their everyday living – in caring, in responding to constraints on their daily lives, in making sense of things with reference to their familiar pasts (in the manner conceptualized by Hagerstrand 1970, Tronto 2003, Anderson 2008, and many others). The official future-makers, at present, do not seem to be hearing the stories that local people are telling about what those futures could and should include. The conditions in which the producers of expert knowledge might 'slow down' to listen (cf Whatmore and Landstrom

2011) are evidently not present. This is not to suggest that local people should be the sole arbiter of knowledge and overly privileged in decision-making; but it is to say that effective planning of adaptation requires recognition of diverse temporalities and the inclusion of the varied perspectives of local people.

The temporalities of adaptive responses to sea-level rise

There are varied temporalities associated with places such as Gippsland East, and these "temporal dimensions of a place are at least as important as the spatial ones" (Robin 2012: 75). This in part explains why measures to adapt to sea-level rise have been far from successful (Moser, Williams, and Boesch 2012), for they have by and large proposed singular spatial fixes to manage long-term changes that are unpredictable and discontinuous from the temporal reality of the everyday. These spatial fixes do not fit with local understandings of time-space, for they seek to effect solutions rapidly, and are seen to transfer many of the costs of adaptation onto present generations, in the form of devalued assets and constraints on local economic development. Institutions fail to acknowledge that, given uncertainties about impacts, some of these costs may be better distributed into the future when risks are more evident. Fitting institutions to align appropriately with varied spatial scales (Young 2002), then, requires fitting institutions to align with *temporal* scales. Those temporal scales would be a varied set, recognizing that many temporalities co-exist in places (cf Urry 2008). They would include institutional attempts to characterize the specificity of connections to the past in places and to understand the particular constraints on and hopes for the future that the everyday lives of local residents exhibit (cf Hagerstrand 1970).

Getting the institutions of risk management to take into account the temporalities of local places and the groups within them will itself take time. But thus far adaptation institutions seem to be in a hurry, working to political and bureaucratic schedules and not local times. For example, in our study areas some policies anticipating sea-level rise and adaptation to it have, in the words of one respondent, interpreted "planning for" sea-level rise as "plan now, rather than giving people, organisations, applicants, or the industry, the opportunity to

actually establish strategies". Some locally-situated policy actors are frustrated because institutional priorities expect "that all the answers are required now". This situation has prompted new kinds of thinking about adaptation to long-term environmental change, with some decision-makers amongst our interviewees suggesting that adaptation needs to "slow down and have a process that we trust". In the words of one policy actor:

> We've now got the data, we've now got the tools and we have to explain these very well over the next three to five years to the populace and industry sectors as well so they can understand when we start to consolidate and start to nail policy positions.

The sense of urgency in climate change *mitigation* policy—captured in Australia in talk of the "critical decade"—should not pervade discussions about *adaptation*: there is time to plan for adaptation, although this planning needs to begin now and the form it will take requires discussion. We accept that this urgency to establish rules now for the distant future may be a characteristic of the governance of this jurisdiction in particular, and that other local parts of the world or indeed the nation may envy the attention being paid to designing adaptive responses to likely sea-level rise in this place. But the point we are making is not that there should be no planning for environmental change in future, but rather that the planning should not be so hasty as to create unintended damage. It should be 'well-planned' planning, and this requires a little time to be taken to know its context.

As part of their slowing down, and perhaps as the reason for their slowing down, policies of adaptation to long-term environmental change require reconciliation with local characteristics and temporalities (cf Hulme et al. 2009; Whatmore and Landstrom 2011; Lane et al. 2011, 2013). Adaptation in this context might usefully proceed as a series of short steps in the long and unending (and certainly not linear) process of adjusting to sea-level rise. The time for adaptation to sea-level rise is not an empty, temporal space between the present and some distant future point, decades away. Rather, the time between now and the distant future is an eventful period that can be calibrated and constructed as having particular, material characteristics for decision-makers to respond to as events unfold (Brace and Geoghegan 2011). Recognizing this requires accepting

a level of indeterminacy and abandoning the possibility of a one-off, spatio-temporal fix to manage the risks of sea-level rise.

Short-term timing of responses to long-term environmental futures offers a means to build in iteration and adjustment as environmental changes unfold. Sea-level rise means the future will be unlike the present; we cannot predict precisely how the future will appear when seen from the viewpoint of the everyday. Waiting, and acting in short steps, each step being triggered by a change in environmental (or social) conditions, offers a fairer and more practicable approach. There are a variety of times in action, simultaneously, as Urry (2009) has said, and this approach is more likely to capture them and the benefits of acknowledging them, than is the current overarching and simple policy strategy. The approach need not entail a uniform set of choices for all people and places, for choices within each step in the pathway can be tailored for different groups and circumstances.

The principle that adaptation to projected environmental futures is a *process* to be managed in steps along a 'pathway' is slowly being recognized (Bloetscher, Heimlich, and Meerof 2011; Haasnoot et al. 2013; Ranger, Reeder, and Lowe 2013; Abunnasr, Hamin, and Brabec 2014). Such an approach creates time and space for meaningful local engagement, and for further information about local time-spaces to be collected; it better calibrates the responsibility for decision-making across generations; it enables iterative responses that take account of new knowledges, technologies, the resolution of uncertainties, and changed values and political and economic conditions; it helps overcome the opposition of climate skeptics (since most costly actions can be avoided until there is more evidence of change); it distributes the costs of adaptation more efficiently across generations; it enables no-regrets actions to commence in the short-term; it creates (temporal) spaces in which people can be given more choices about how to adapt. Such approaches do not propose to determine all actions now, for the future , but rather craft a set of early actions and a flexible process that aims to achieve shared vision of the future for places. Effective adaptation responses to sea-level rise therefore require multiple actions in *time*, acknowledging the many temporalities at play, rather than single fixes in *space*.

Conclusion

From the perspective of social geographies of time-space, contemporary geographical research into climate change privileges the spatial, and engages insufficiently with the temporal. We have suggested how the past and the future are present in the contemporary meaning and experience of local places, and that there are many temporalities in adaptation to sea-level rise. In Gippsland East, where the past circulates in residents' accounts, the future arrives through expert knowledge, popular imaginaries, and the effects of decisions.

Imagining an ongoing planning framework which includes local residents and business people along with researchers and governmental decision-makers in managing pathways to the future, is a difficult matter. It is our conclusion that developing a grounded view of the future of everyday lives in places requires that the "long term" is viewed in a non-linear way as a series of "short terms", of different lengths, kinds of overlap, and characteristics. Understanding the long-term as made up of a series of varying short-terms is conceptually a more astute starting point for institutions concerned with environmental futures than one in which the present is seen as having certain features and the future as having others, with the time between them remaining unexamined. Bringing the relevant contributors to the table to devise a view of these overlapping 'short terms' and the trigger points between them is a key step for further research and for policy development.

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References

Abunnasr, Y., E. Hamin, and E. Brabec. 2014. Windows of opportunity: addressing climate uncertainty through adaptation plan implementation. *Journal of Environmental Planning and Management*, doi:10.1080/09640568.2013.849233

Anderson, D. 2008. Drought, endurance and 'the way things were': the lived experience of climate and climate change in the Mallee. *Australian Humanities Review* 45: 67-81.

Anderson, N. 2010. Preemption, precaution, preparedness: anticipatory action and future geographies. *Progress in Human Geography* 34(6): 777-798.

Australian Bureau of Statistics. 2011. *2011 Census Quickstats*. Canberra: Australian Bureau of Statistics.

Barnett, J., and N. Adger. 2003. Climate change and atoll countries. *Climatic Change* 61(3): 321-337.

Barnett, J., R. Fincher, A. Hurlimann, S. Graham, and C. Mortreux. 2014. *Equitable Local Outcomes in Adaptation to Sea-Level Rise: Year 1 Project Report 2011*. Melbourne: The University of Melbourne.

Bloetscher, F., B. Heimlich, and D. Meerof. 2011. Development of an adaptation toolbox to protect southeast Florida water supplies from climate change. *Environmental Reviews* 19: 397-417.

Brace, C., and H. Geoghegan. 2011. Human geographies of climate change: Landscape, temporality, and lay knowledges. *Progress in Human Geography* 35(3): 284-302.

Brown, C.S., S. Lloyd, and S.A. Murray. 2006. Using consecutive Rapid Participatory Appraisal studies to assess, facilitate and evaluate health and social change in community settings. BMC Public Health 6:68-75.

Crang, M. 2010. The calculus of speed: accelerated worlds, worlds of acceleration. *Time & Society* 19(3): 404-416.

DCC (Department of Climate Change) 2009. *Climate Change Risks to Australia's Coasts: A First Pass National Assessment*. Canberra: Commonwealth of Australia.

Evans, B. 2009. Anticipating fatness: childooh, affect and the pre-emptive 'war on obesity'. *Transactions of the Institute of British Geographers* 35: 21-38.

Farbotko, C. 2010a. Wishful sinking: disappearing islands, climate refugees and cosmopolitan experimentation. *Asia Pacific Viewpoint* 51(1): 47-60.

———. 2010b. "The global warming clock is ticking so see these places while you can": Voyeuristic tourism and model environmental citizens on Tuvalu's disappearing islands. *Singapore Journal of Tropical Geography* 31(2): 224-238.

Graham, S., J. Barnett, R. Fincher, A. Hurlimann, C. Mortreux, and E. Waters. 2013. The social values at risk from sea-level rise. *Environmental Impact Assessment Review* 41: 45-52.

Griffiths, T. and Robin, L. (eds.) 1997. *Ecology and Empire: Environmental History of Settler Societies*. Edinburgh: Keele University Press.

Grosz, E. 2004. *The Nick of Time*. Sydney: Allen & Unwin.

Haasnoot, M., J. Kwakkel, W. Walker, and J. ter Maat. 2013. Dynamic adaptive policy pathways: A method for crafting robust decisions for a deeply uncertain world. *Global Environmental Change* 23(2): 485-498.

Hagerstrand, T. 1970. What about people in regional science? *Papers of the Regional Science Association* 24: 7-21

Harvey, D. 1996. *Justice, Nature and the Geography of Difference.* Oxford: Blackwell

———. 1990. *The Condition of Postmodernity*. Oxford: Blackwell

Hulme M. 2010. Problems with making and governing global kinds of knowledge. *Global Environmental Change* 20:558-64.

Hulme, M., S. Dessai, I. Lorenzoni, and D. Nelson. 2009. Unstable climates: exploring the statistical and social constructions of "normal" climate. *Geoforum* 40: 197-206.

IPCC (Intergovernmental Panel on Climate Change). 2013. *Climate Change 2013: The Physical Science Basis:* Working Group I contribution to the IPCC Fifth Assessment Report. http://www.climatechange2013.org/report/

Lane, S., V. November, C. Landstrom, S. Whatmore. 2013. Explaining rapid transitions in the practice of flood risk management. *Annals of the Association of American Geographers*. 103: 33-342.

Lane, S., N. Odoni, C. Landstrom, S. Whatmore, N. Ward, S. Bradley. 2011. Doing flood risk science differently: an experiment in radical scientific method. *Transactions of the Institute of British Geographers* NS 36: 15-36.

Macintosh, A. 2012. Coastal climate hazards and urban planning: how planning responses can lead to maladaptation, *Mitigation and Adaptation Strategies for Global Change* 18: 1035-1055.

Marino E, and J. Ribot. 2012. Adding insult to injury: climate change and the inequities of climate intervention. *Global Environmental Change* 22:323-228.

McGranahan G., D. Balk, and B. Anderson. 2007. The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones. *Environment and Urbanization* 19, 17-37.

Measham, T.G. 2003. Learning and change in rural regions: understanding influences on sense of place. Unpublished PhD Thesis. Canberra: Australian National University.

Moser, S., S. Williams, and D. Boesch. 2012. Wicked challenges at Land's End: managing coastal vulnerability in climate change. *Annual Review of Environment and Resources* 37: 51-78.

Myers, T., E. Maibach, C. Roser-Renouf, K. Akerlof, and A. Leiserowitz. 2013. The relationship between personal experience and belief in the reality of global warming. *Nature Climate Change* 3: 343-347.

Nielsen J. Ø., and F. Sejersen. 2012. Earth system science, the IPCC and the problem of downward causation in human geographies of global climate change. *Geografisk Tidsskrift* (Danish Journal of Geography) 112: 194-202.

O'Brien, K., and J. Barnett. 2013. Global environmental change and human security. *Annual Review of Environment and Resources* 38: 373-391.

Ranger, N., T. Reeder, and J. Lowe. 2013. Addressing 'deep' uncertainty over long-term climate in major infrastructure projects: four innovations of the Thames Estuary 2100 Project. *EURO Journal on Decision Processes* 1(3-4): 233-262.

Robin, L. 2012. Global ideas in local places: the humanities in environmental management. *Environmental Humanities* 1: 69-84.

Rosa, H., and W. Scheuerman. (eds.) 2009. *High-Speed Society: Social Acceleration, Power and Modernity*. University Park PA: Pennsylvania State University Press.

Rudiak-Gould, P. 2012. Promiscuous corroboration and climate change translation: A case study from the Marshall Islands. *Global Environmental Change* 22(1): 46-54

Stolp, A., W. Groen, J. van Vliet, and F. Vanclay. 2002. Citizen values assessment: incorporating citizens' value judgements in environmental impact assessment. *Impact Assessment and Project Appraisal* 20(1): 11-23.

Swyngedouw, E. 2010. Apocalypse forever? Post-political populism and the spectre of climate change, *Theory, Culture & Society* 27(2-3): 213-232.

Taylor, P. 2009. Time: from hegemonic change to everyday life, in *Key Concepts in Geography*, 2nd Edition, eds. N. Clifford, S. Holloway, S. Rice and G. Valentine, 140-152, Los Angeles: Sage.

Thrift, N. 1996. *Spatial Formations.* London: Sage.

Tronto, J . 2003. Time's space. *Feminist Theory* 4(2): 119-138.

Urry, J. 2009. Speeding up and slowing down, in *High-Speed Society: Social Acceleration, Power and Modernity* eds. H. Rosa & W. Scheuerman, 179-198, University Park, Pennsylvania: Pennsylvania State University Press.

Victorian Government 2013. *Victorian Climate Change Adaptation Plan* Melbourne: Victorian Government.

Waters, E., F. McKenzie, C. McCarthy, and S. Pendergast. 2010. *The Drying Lake: Lake Boga's experience of change and uncertainty*. Melbourne: Victoria Department of Planning and Community Development.

Whatmore, S. and C. Landstrom. 2011. Flood apprentices: an exercise in making things public. *Economy and Society* 40: 582-610.

Whitehead, M. 2005. Between the marvellous and the mundane: everyday life in the socialist city and the politics of the environment. *Environment and Planning D* 23: 273-294.

Whitmarsh, L. 2008. Are flood victims more concerned about climate change than other people? The role of direct experience in risk perception and behavioural response. *Journal of Risk Research* 11(3): 351-374.

Young, O. 2002. *The institutional dimensions of environmental change : fit, interplay, and scale*. Cambridge MA: MIT Press.

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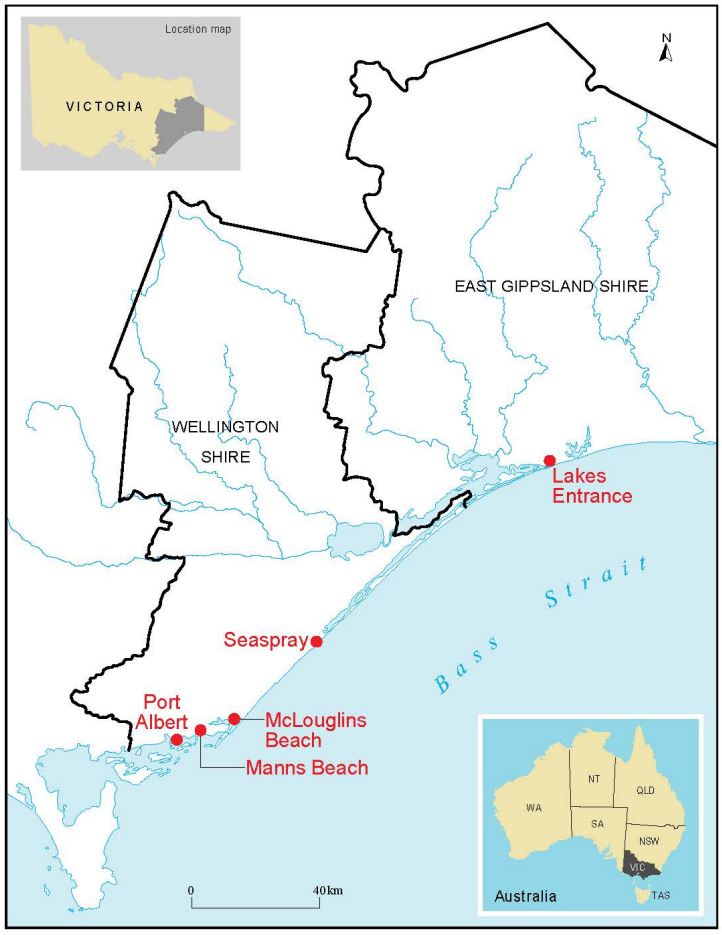
Figure 1: Five communities in East Gippsland, Victoria, Australia


Location map
VICTORIA
N
EAST GIPPSLAND SHIRE
WELLINGTON
SHIRE
Lakes
Entrance
Bass Strait
Seaspray
Port
Albert
McLouglins
Beach
Manns Beach
0
40km
NT
QLD
WA
SA
NSW
VIC
TAS
Australia