1 **ARTICLE TITLE:**

2 Advancing values-based approaches to climate change adaptation: a case study from Australia

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Abstract

24 Coastal flooding affects physical and social place attachments. Values-based approaches to

25 climate change adaptation examine how risks to place attachments are distributed within and

26 among communities, with a view to informing equitable adaptation policies. In this nascent body of

27 research, divergent theoretical frameworks and empirical approaches to measuring social values

28 are evolving. While some studies explore the things people value about their everyday lives

29 generally—the lived values approach, others locate specific social and cultural values in

30 geographic space—the landscape values mapping approach. This study aims to compare the

31 explanatory value of these two approaches for understanding the social risks of sea-level rise, and

32 appraise whether either or both approaches are likely to meet local adaptation planning needs. It

33 does this by examining the potential social impacts of sea-level rise in Kingston Beach, Australia,

34 informed by a mail-out survey of the community. The lived values approach identified that the

35 natural environment, scenery, relaxed lifestyle and safety are highly important to local residents,

36 while the landscape values mapping approach revealed that Kingston Main Beach is the most

37 highly valued of eight coastal landscape units. Incorporating the landscape values mapping into

38 the lived values cluster analysis revealed that while Kingston Main Beach is highly important for its

39 recreational value to some members of the community, for others manmade features such as

40 community halls or sports ovals may be of higher importance because they facilitate social

41 interactions. There is potential to further integrate these two approaches to better inform

42 adaptation policy about how lived and landscape values are distributed among communities and

43 located in space. A deeper understanding of such values can lead to improved engagement with

44 coastal residents to inform adaptation policy.

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Highlights

- Diverse lived values—recreation, scenery and safety—are at risk of sea-level rise

- Only a subset of natural landscape units at risk are highly valued by residents

- Distinct groups of residents have unique sets of lived and landscape values

- Equitable adaptation policies require accommodating diverse lifestyles and values

- A combination of lived and landscape approaches can better inform adaptation policy

Keywords

Coastal inundation, local communities, place values, policy, public participation GIS, vulnerability

Acknowledgements

1 Introduction

Planning for sea-level rise is well underway at local, regional and national scales worldwide, yet planning focuses on ameliorating the physical rather than social impacts of sea-level rise (Karlsson et al., 2015; O'Brien and Wolf, 2010). For example, government adaptation plans typically focus on the need to *protect* communities, *accommodate* sea-level rise, or *retreat* manmade infrastructure, and many local government adaptation policies in Australia require new developments be built above predicted rises in mean sea-levels (e.g. McInnes et al., 2016). Beyond infrastructure, there is an emphasis on understanding and minimising impacts on the natural environment, such as ensuring that biodiversity and ecosystem resilience are maintained (Baker et al., 2012). A notable absence from many plans is consideration of how to reduce the impacts of sea-level rise and coastal flooding on non-material social values (Adger et al., 2009, 2013).

To address this gap, non-material 'values-based' approaches to climate adaptation have been developed to explore what people value most about their everyday lives, and how these social values are likely to be affected by environmental changes and the policies developed to respond to such changes (Persson et al., 2015). Values-based approaches seek to redress the emphasis of adaptation planning on physical impacts by putting the lifestyle and wellbeing attributes that matter most to communities at the centre of adaptation analyses (O'Brien and Wolf, 2010). While values-based approaches are receiving increased attention by scholars, it is unclear to what extent they are being adopted by decision-makers. The aim of this study is to further evaluate the potential utility of two values-based approaches for informing more socially-oriented adaptation policies.

Early values-based studies on climate adaptation involved qualitative research into the social and cultural values and activities that determine 'how' people interpret and respond to environmental changes and adaptation policies (e.g. Kuruppu, 2009; Nielsen and Reenberg, 2010; Wolf et al., 2013). Kuruppu (2009) found that religion potentially impedes climate adaptation in Kiribati because it shapes the goals that individuals pursue. Nielsen and Reenberg (2010) identified that cultural values of the *Fulbe* ethnic group of Burkina Faso prevent them from embracing particular adaptation strategies. Wolf et al. (2013) showed how diverse values within two Canadian

88   communities may act as barriers to adaptation. While such studies are useful for understanding

89   constraints to climate adaptation, they offer few practical suggestions for how decision-makers can

90   "address values explicitly" (Wolf et al., 2013: 560).

91   Graham et al. (2014) argues that values-based approaches to adaptation can explicitly address

92   values by focusing on 'what' people value about their everyday lives, rather than 'how'. They

93   proposed that values-based approaches should investigate the diversity of 'lived values'—

94   valuations that individuals make about *what* is important in their lives and the places they live

95   (Graham et al., 2013: 49, emphasis added)—that exist within communities and how these lived

96   values are impacted by environmental change. In collaboration with two local governments, they

97   developed a quantitative method for measuring lived values and evaluating differences that exist

98   within (Graham et al., 2014) and across (Barnett et al., 2014a) communities. This method was

99   published in *A Guide for Local Government* (Barnett et al., 2014b) to facilitate uptake of the lived

100   values approach by planners in Australia and internationally.

101   There have been two applications of the lived values approach in Australia that focus on the

102   impacts of sea-level rise and distributional effects of adaptation planning within communities

103   (Graham et al., 2014; Kreller, 2016). These studies concluded that the lived values approach is

104   useful in shifting the focus of adaptation towards non-material values and enables policies to be

105   tailored to meet the needs of diverse segments of the population. Although the values elicited

106   through the lived values approach can direct policy-makers towards the general impacts from sea-

107   level rise and groups of people at risk, there is scope to provide further definition on what

108   individual's value about the coastal landscape and natural environment.

109   A third values-based approach to climate adaptation focuses on the social and cultural landscape

110   values that people ascribe to particular physical places, i.e. the 'where'. The landscape values

111   mapping approach[1] was originally developed to associate perceived social values with landscapes

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[1] There are a range of terms used in the literature to describe the process of mapping social and cultural values. These include 'participatory mapping' (Plieninger et al., 2013), 'mapping social values' (Tyravainen et al., 2007) and 'landscape values methodology' (Raymond and Brown, 2011). Here we use the term landscape values mapping (Brown 2006) to encapsulate these overlapping methods.

112   and include local or marginalised populations in natural resource planning and decision processes.

113   For example, in NSW, Australia the method has been used to include indigenous attachments to

114   landscape in the management of National Parks (Brown, 2008).

115   More recently, Novaczek et al. (2011) sought to adapt the landscape values mapping approach to

116   a climate adaptation context. They explicitly sought to evaluate whether landscape values mapping

117   can be used as a decision-support tool for climate adaptation, working closely with a provincial

118   Canadian government department to create maps of the study area and adapted the typology of

119   values (following Brown, 2004) to be more specific to coastal environments and activities. They

120   concluded that landscape values mapping was a useful tool for enabling coastal communities to

121   explore and recognise their values and raise awareness of the non-material losses that are likely to

122   occur in a changing climate. They also argued that the approach is useful for policy-makers

123   because it is affordable, inclusive and collaborative and enables decisions to be made that take

124   into account diverse values and priorities. There is considerable scope for this approach to be

125   applied elsewhere, yet we know of no applications of this approach to sea-level rise adaptation in

126   Australia nor how it may compare with the lived values approach.

127   This paper evaluates the usefulness of the lived values and landscape values mapping

128   approaches for informing climate adaptation planning. A case study in the coastal suburb of

129   Kingston Beach in Tasmania, Australia, is used to elucidate the social values that exist within the

130   community and to understand risks from sea-level rise. Section 2 introduces the case study, the

131   methodology is outlined in section 3 and results presented in section 4. The discussion in section 5

132   compares the utility of both approaches and outlines more broadly how policy-makers can utilise

133   both methods in coastal adaptation planning. Conclusions are drawn in section 6.

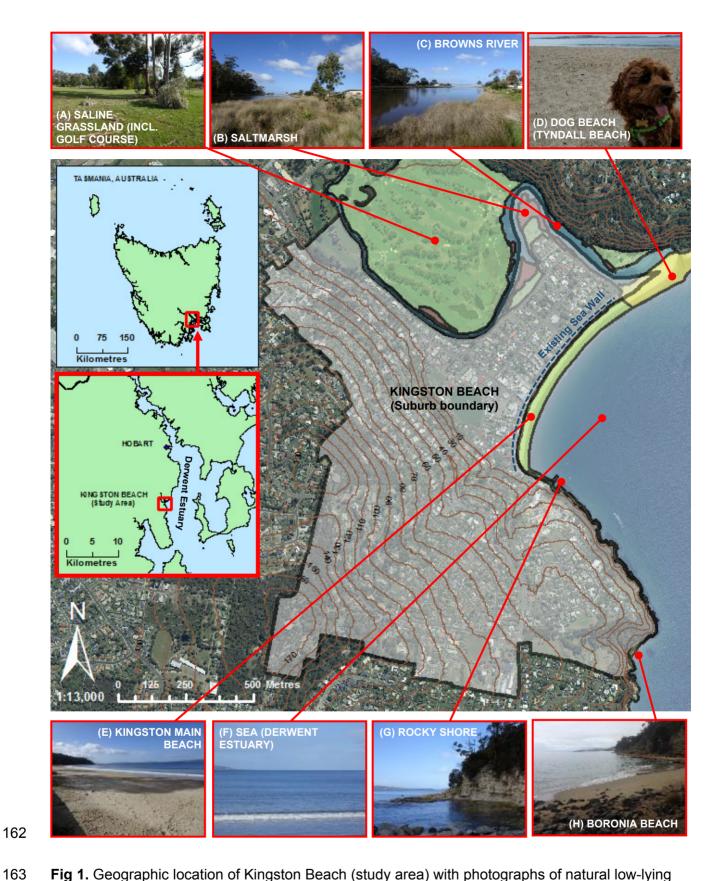## 134   2   Case study site: Kingston Beach

135   The suburb of Kingston Beach is located in southern Tasmania, Australia and is 13 km from

136   Hobart, Tasmania's capital city (Fig 1). It has approximately 2000 residents with one-quarter of the

137   965 dwellings situated less than 3 m above mean sea-level. The local municipality, Kingborough

138   Council, has undertaken traditional coastal risk assessments to inform its adaptation planning (e.g.

139   Climate Planning, 2016), however to date little work has been undertaken to understand the social

140   values at risk.

141   The case study site is a useful location to examine values-based impact assessments as the

142   suburb is predominantly residential, with iconic landscapes (e.g. beaches) and low-lying

143   infrastructure. The study area is faced with a unique flood risk that could threaten social values

144   because of the interaction between Browns River (Photo C, Fig 1) and the Derwent Estuary (Photo

145   F, Fig 1). Historically, there have been riverine floods from Browns River that have caused damage

146   to adjacent houses and infrastructure (Climate Planning, 2016). Anecdotal evidence suggests that

147   storms throughout the mid 1900's caused waves from the Derwent Estuary to break over Kingston

148   Main Beach onto the esplanade, dragging boats from their moorings and destroying jetty

149   infrastructure (Gardam, 1988: 65).

150   A modest sea-level rise in the order of 0.5 m by the end of the centurary (McInness et al., 2016)

151   has the potential to change and/or inundate parts of Kingston Main Beach (Photo E, Fig 1),

152   including Tyndall Beach, which is reserved for dog exercise and referred to as the 'dog beach'

153   (Photo D, Fig 1). Both beaches have little ability to recede landward with sea-level rise; Kingston

154   Main Beach is backed by an aging concrete sea wall (Gardam, 1988: 66) and the dog beach is

155   backed by rising hard bedrock (Sharples and Donaldson, 2014). Sea-level rise would have other

156   consequences to natural landscapes in the area, potentially raising the local groundwater table,

157   which could impact flora and fauna in the saltmarsh (Photo B, Fig 1), saline grassland (Photo A,

158   Fig 1) and bordering forest (Knight, 2016). Additionally, sea-level rise could lead to increased

159   flooding impacts from Browns River, in particular through a combined storm tide and riverine

160   flooding event, damaging physical infrastructure. A modelled 1 in 100-year coincident flood event

161   with 1 m of sea-level rise was estimated to expose $217 million of assets (Climate Planning, 2016).

Fig 1. Geographic location of Kingston Beach (study area) with photographs of natural low-lying coastal landscapes (i.e. landscape units). Contours at 10 m intervals highlight low-lying areas in the suburb near the beaches and Browns River.

3   Methods

The lived values and landscape values mapping approaches primarily rely on surveys (e.g. interviews, mail-outs or online) for data collection. Eight place-based observations (i.e. how coastal land is used by residents) and ten semi-structured interviews were undertaken to finalise the survey questions prior to distribution (as per Graham et al., 2014). Qualitative analysis of the place-based observations revealed social values enacted by residents and the semi-structured interviews captured lived and landscape values voiced by residents.

3.1   Survey of the suburb

3.1.1   Survey design

Landscape values mapping requires participants to interact with a spatial map of the region, hence participants must receive a mail-out survey or undertake it online. Both options were made available to participants in this study. The survey contained the following sections: 1) connection to the area; 2) household characteristics; 3) lived values and frustrations; 4) everyday activities; 5) social networks; and 6) landscape values mapping (see Appendix A for full survey). The questions in sections 1 to 5 were developed from Barnett et al. (2014b) and adapted to the context of this study location. The 16 most frequently mentioned lived values during the semi-structured interviews were included in the mail-out survey, ensuring that lived values from each of the five categories identified in Graham et al. (2013) were included. Given young families were under represented in the interviews, 'a unique place for children to grow up' was added as a lived value.

The landscape values mapping was guided by Brown (2006), Tyrvainen et al. (2007) and Plieninger et al (2013). A shortlisted typology of nine social values was identified through semi-structured interviews (Appendix B). An aerial map of the study area was provided with the survey showing photographs of eight predefined coastal areas (landscape units). Respondents were asked to rank up to three of the coastal landscapes in order of importance for each of the nine values. This forced respondents to prioritise landscapes and allowed a weighted score to be determined, reflecting overall community preference (rank 1 = 3 points; rank 2 = 2 points; rank 3 = 1 point).

193 **3.1.2   Survey response**

194 During October 2016, 961 surveys were hand-delivered to dwellings in the suburb. Follow-up

195 postcards (recommended by Dillman, 2007) were hand delivered 10 days after the survey. It was

196 specified that surveys were to be completed by decision-makers in the dwelling.

197 In total, 322 survey responses were received (284 hard copy; 38 online) which represented a 34%

198 response rate. The response rate was comparable to other values-based surveys (e.g. 47% in

199 Brown 2006; 28% in Graham et al., 2014; 29% in Novaczek et al., 2011). The socio-economic

200 characteristics of the sample was consistent with the census data for gender, household

201 composition and median income (Table 1).

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203 **Table 1.** Socio-economic characteristics for the survey sample, compared to the suburb, State and

204 nation.

Characteristic	Australia (2011)	Tasmania (2011)	Suburb of Kingston Beach (2011)	Survey (Nov 2016)
Private dwellings	9.1 million	232,380	965	322
Median age[*]	45	50	53	55-64
Female:Male Ratio[*]	51:49	52:48	53:47	59:41
Average people/house	2.6	2.4	2.3	2.3
Median weekly household income	$1,234	$948	$1,097	$1000-$1999
Full time employment	58%	54.5%	55%	25%
University of higher	14.3%	11.8%	17.7%	58%

205 [*] Median ages and gender ratios have been calculated for the adult (18 years and older) population of Australia,
206 Tasmania and the suburb of Kingston Beach to directly compare with survey respondents.

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208 **3.2   Analysis methods**

209 **3.2.1   Landscape values analysis and social landscape metrics**

210 To assess the degree of association between values and those landscapes identified as being

211 most important for each value (i.e. rank =1), a chi-squared test for independence was used. The

212 level of significance in the association was observed using standardised residuals as done in

213 Strickland-Munro et al. (2016).

214 The landscape values mapping data was then converted into metrics (Brown and Reed, 2011) to

215 further investigate the type and distribution of values assigned to landscapes. Whilst other metrics

216 are available to quantify the dominance and diversity of values assigned to landscapes, we focus

217 on the value sum (P0) and value sum precent (P1) metrics which indicate landscape units that

218 have the highest number of values assigned to them.

219 **3.2.2   Lived values cluster analysis**

220 Following the method used by Graham et al. (2014), cluster analysis was used to segment the

221 community into groups based upon life characteristics. The variables selected for inclusion were:

222 gender, employment status, community group membership, social network and previous location

223 of residence. All variables were categorical and were standardised prior to analysis. Correlations

224 were run to ensure that there were no redundant variables. The correlation coefficient for all

225 variables was below 0.62. The study used hierarchical followed by k-means clustering with

226 pairwise deletion of variables.

227 Once the final cluster solution was found, chi-square tests of independence ($p < 0.05$) were used

228 to evaluate whether there were significant differences between the groups with respect to their

229 lived and landscape values. This provided one mechanism for comparing the explanatory value of

230 the lived and landscape values mapping approaches.

231 # 4   Results

232 ## 4.1   Community lived values

233 Respondents identified 45 distinct values that were important to them about living in the suburb of

234 Kingston Beach (Appendix C). The top five values, mentioned in response to open-ended

235 questions, included the beach (n=118, n is the number of survey respondents), ease to get to

236 places (n=112), the scenery and views (n=83), the natural environment (n=46) and relaxed beach

237 lifestyle (n=45). The top five values that respondents rated as being very important from a

238 predetermined list in the survey were the scenery and views (n=248), a safe place to live (n=230),

239 relaxed lifestyle (n=230), peacefulness (n=228) and natural environment (n=222). Easy access to

240 the beach and easy to get to places were on the predetermined list, and were the seventh and

241 tenth most highly rated lived values. Recreational activities that respondents most frequently

242 undertook each day in the area were walking (n=182), accessing the beach (n=105) and dog

243 walking (n=80). The emphasis on the beach, scenery and environment in these articulated and

244 enacted valuations demonstrate the importance of natural landscapes to the everyday lives of

245 residents. Temporal (relaxed and convenience) and safety aspects were also important.

246 **4.2 Values mapped to coastal landscapes**

247 A summary of values and their association to landscapes are provided in Table 2. A significant

248 statistical correlation was observed between landscape units and respondent values (X^2 = 846.15;

249 d.f. = 56; p < 0.01; Table 2). This suggests that coastal landscapes are valued for specific

250 purposes by residents – for example the saltmarsh is highly valued as having minimal intrusion on

251 the natural environment (i.e. natural value) and for the variety and abundance of flora and fauna

252 (i.e. biodiversity value), while the Derwent Estuary is highly valued for providing enjoyable scenery,

253 sights, sounds and smells (i.e. aesthetic value) and for enabling future generations to experience

254 healthy, productive and sustainable ecosystems (i.e. future value).

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Table 2. Association of values with landscapes. Score refers to the number of times respondents ranked the landscape value as most important (rank = 1) along with the percentage of times the landscape was ranked most important overall. Standardised residuals greater than +2.0 (bold) and -2.0 (underline) reflect significantly greater or fewer observed frequencies respectively.

Value		A Saltmarsh	B Grass / golf course	C Browns River	D Dog Beach	E Kingston Beach	F Sea / Derwent	G Rocky shore	H Boronia Beach	Total
						Coastal landscape unit				
Access	Score	2	7	7	**41**	**172**	31	3	23	286
	%	2%	7%	3%	**24%**	**16%**	9%	3%	8%	
	Residuals	-2.84	-1.22	-4.46	**4.59**	**3.94**	-1.35	-2.44	-1.64	
Aesthetic	Score	0	6	17	14	138	**63**	15	30	283
	%	0%	6%	6%	8%	13%	**19%**	16%	11%	
	Residuals	-3.41	-1.49	-2.66	-1.36	1.05	**3.83**	1.19	-0.35	
Biodiversity	Score	**24**	**29**	**72**	3	39	44	11	49	271
	%	**24%**	**31%**	**26%**	2%	4%	13%	12%	18%	
	Residuals	**3.86**	**5.73**	**7.45**	-3.70	-7.45	1.08	0.13	3.32	
Future	Score	17	7	34	9	110	**66**	2	25	270
	%	17%	7%	12%	5%	10%	**20%**	2%	9%	
	Residuals	1.78	-1.06	0.61	-2.32	-0.95	**4.71**	-2.63	-0.99	
Historic	Score	10	12	**66**	3	93	20	13	22	239
	%	10%	13%	**24%**	2%	9%	6%	14%	8%	
	Residuals	0.06	0.91	**7.48**	-3.39	-1.32	-2.26	1.20	-0.96	
Identity	Score	0	5	13	**30**	**187**	15	2	9	261
	%	0%	5%	5%	**17%**	**17%**	4%	2%	3%	
	Residuals	-3.27	-1.60	-3.05	**2.66**	**6.54**	-3.50	-2.56	-3.77	
Recreation	Score	2	14	23	**35**	**167**	24	4	8	277
	%	2%	15%	8%	**20%**	**15%**	7%	4%	3%	
	Residuals	-2.78	1.01	-1.50	**3.45**	**3.91**	-2.30	-2.07	-4.16	
Therapeutic	Score	1	7	16	29	126	44	16	38	277
	%	1%	7%	6%	17%	12%	13%	17%	14%	
	Residuals	-3.08	-1.13	-2.75	2.10	0.22	0.93	1.58	1.20	
Natural	Score	**44**	7	28	9	54	29	**29**	**71**	271
	%	**44%**	7%	10%	5%	5%	9%	**31%**	**26%**	
	Residuals	**9.85**	-1.07	-0.49	-2.34	-6.08	-1.37	**5.67**	**7.30**	
Total	Score %	100	94	276	173	1086	336	95	275	

Seven of the nine values were most frequently mapped to Kingston Main Beach and thus it had the highest overall weighted score (Table 3). This was followed by the sea and Browns River. Kingston Main Beach was the most frequent landscape unit used daily for recreational purposes (n=96), followed by the Dog Beach (n=48) and Browns River (n=29), supporting the strong access and recreational values associated with the beach.

275 **Table 3.** Selected social landscape metrics for coastal landscape units. Highest (bold) and lowest

276 (underline) metric values are indicated.

| Index name (see table footnotes) | Coastal landscape unit (Fig 1) | | | | | | | |
	A Saltmarsh	**B** Grass / golf course	**C** Browns River	**D** Dog Beach	**E** Kingston Beach	**F** Sea / Derwent	**G** Rocky shore	**H** Boronia Beach
(P0) Value Sum Absolute	<u>320</u>	377	1205	659	**1884**	1146	810	865
(P1) Value Sum Percent	<u>4.4%</u>	5.2%	16.6%	9.1%	**25.9%**	15.8%	11.1%	11.9%
Weighted Score reflecting preferences	<u>614</u> <u>(4.2%)</u>	714 (4.9%)	2187 (14.9%)	1296 (8.8%)	**4633** **(31.5%)**	2288 (15.6%)	1278 (8.7%)	1685 (11.5%)
Rank	<u>8</u>	7	3	5	**1**	2	6	4

277   P0 = counts the number of times the landscape unit was ranked 1st, 2nd or 3rd
278   P1 = percentage of P0 relative to total number of values mapped
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280 ## 4.3   Lived and landscape values

281 Cluster analysis revealed that there are six clearly distinguishable groups of residents who had

282 unique sets of lived and landscape values. Table 4 presents variables included in the cluster

283 analysis and Table 5 shows the lived and landscape values that were statistically significantly

284 different across the clusters ($p < 0.05$). The following descriptions of the six groups are drawn from

285 the results in these two tables.

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293 **Table 4.** Variables included in the cluster analysis and resulting cluster characteristics. The

294 clusters with the highest (bold) and lowest (underline) percentage of each variable are indicated.

Selected variables	Cluster 1: Work-life balancing families	Cluster 2: Physically-active, full-time workers	Cluster 3: Team-sports oriented residents	Cluster 4: Community minded retirees	Cluster 5: Independent retirees	Cluster 6: Reclusive retirees
N	48	59	43	76	46	50
Cluster %	14.9	18.3	13.4	23.6	14.3	15.5
Children (%)	**79.2**	48.3	30.2	2.7	<u>2.2</u>	4.0
Female (%)	**93.8**	54.2	<u>18.6</u>	60.0	73.3	44.9
Full-time work (%)	2.1	**98.3**	48.8	<u>0.0</u>	2.2	<u>0.0</u>
Part-time work (%)	**87.5**	<u>0.0</u>	4.7	8.0	8.7	6.1
Retired or semi-retired (%)	<u>0.0</u>	<u>0.0</u>	39.5	**92.0**	78.3	87.8
None or one close friend (%)	45.8	**57.6**	33.3	<u>24.3</u>	36.4	42.0
Member of no community organisations (%)	33.3	59.3	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	**100.0**
Member of one community organisation (%)	27.1	0.0	**100.0**	<u>0.0</u>	100.0	<u>0.0</u>
Member of two or more community organisations (%)	39.6	40.7	<u>0.0</u>	**100.0**	<u>0.0</u>	<u>0.0</u>
Moved from Hobart (%)	71.1	53.6	**92.1**	42.1	<u>31.1</u>	67.4
Moved from Tasmania but not Hobart (%)	17.8	21.4	<u>5.3</u>	25.0	**26.7**	21.7
Moved from outside Tasmania (%)	11.1	25.0	<u>2.6</u>	32.9	**42.2**	10.9

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297 **Table 5.** Variables that are statistically significantly different (p<0.05) across the clusters. The clusters with the highest (bold) and lowest (underline)
298 percentage of each variable are indicated.

	Variables	Cluster 1: Work-life balancing, families	Cluster 2: Physically-active, full-time workers	Cluster 3: Team-sports oriented residents	Cluster 4: Community minded retirees	Cluster 5: Independent retirees	Cluster 6: Reclusive retirees
Demographics	Age (over 65)	2.1	8.6	34.9	**83.6**	62.2	74
	Age (35-64)	58.3	**62.1**	37.2	15.1	31.1	24
	Age (18-34)	**39.6**	29.3	27.9	1.4	6.7	2
	Education (university qualification)	**75**	67.2	48.8	64	52.3	42.9
	Home ownership (owned outright)	52.1	35.6	51.2	**91.9**	82.2	77.6
	Household (one/two person)	31.3	43.1	71.4	95.9	**97.8**	94
	Income (less than $1000/week)	18.8	5.1	23.3	**45.9**	40	40.8
Lived values	Recreational opportunities (very important)	**54.2**	40.4	44.2	32.4	35.6	15.2
	Safety (very important)	**87.5**	84.7	81.4	67.6	64.4	50
	Unique for children (very important)	**59.6**	47.4	48.8	24.7	33.3	20
	Flat landscape (very important)	2.1	18.6	20	**28.6**	22	20
Activities	Volunteer (daily or weekly)	16.7	6.8	16.7	**39.2**	18.2	6.4
	Go for a jog (daily or weekly)	20.8	**27.6**	23.3	1.3	0	4.2
	Go for a bike ride (daily or weekly)	14.6	**27.1**	14	9.3	4.5	14.6
	Go to the gym (daily or weekly)	18.8	**29.3**	16.3	17.1	9.1	4.2
	Visit to parks (daily or weekly)	**43.8**	28.8	23.3	16	20	10.6
	Access the beach (daily or weekly)	**85.4**	83.1	76.2	74.7	67.4	60.4
Interactions and networks	Family (daily or weekly)	**93.8**	83.1	86	71.6	69	72.9
	Friends (daily or weekly)	87.5	70.7	90.7	**92**	83.7	59.6
	Neighbours (daily or weekly)	34	30.5	51.2	**54.7**	45.2	36.7
	Community group members (daily or weekly)	48.9	36.2	55.8	**79.2**	56.8	13.3
Landscape values	Kingston Main Beach - recreation (most important)	48.9	**73.2**	57.1	45.2	71.4	42.9
	Kingston Main Beach – therapeutic (most important)	40.4	**55.4**	54.4	39.7	33.3	26.5
	Sea/Derwent – therapeutic (most important)	14.9	10.7	7.1	13.7	14.3	**30.6**
	Browns River – historic (most important)	27.7	16.1	9.5	**31.9**	24.4	14.3

299

4.3.1 Cluster 1: Work-life balancing families

This group largely comprised highly-educated women with children who work part-time and are members of least one community organisation. The importance of family and providing a particular lifestyle for children is reflected in the diverse lived and landscape values that members of this group ranked as being very important to them. This group was the most likely to rate 'recreational opportunities', Kingston Beach being 'a safe place to live' and 'unique for children' as being very important. They were also the most likely to spend time with family, visit parks and the beach on at least a weekly basis.

4.3.2 Cluster 2: Physically-active, full-time workers

Almost all of the members of this group worked full-time and almost half had children. Although this group had the highest incomes (94.9% had incomes greater than $1000 per week), only one-third owned their home outright. The importance of individual physical activity to this group is reflected in their values. Members of this group were the most likely to go to the gym, go for a bike ride or a jog on at least a weekly basis and the most likely to rate the recreational and therapeutic value of Kingston Main Beach as being most important. Almost all members of this group had moved to Kingston Beach from Hobart.

4.3.3 Cluster 3: Team sport oriented residents

Most of the members of this group comprised men spanning a range of ages, with and without children, including full-time workers and retirees. All group members are only members of one community organisation, of which half are involved in sports and recreational organisations (the most of all of the groups). Members of this group were the second most likely to see their family, friends and neighbours on a daily or weekly basis and rate recreational opportunities as being very important. This group was the least likely to identify the therapeutic value of the sea and the historic value of the Browns River as being very important to them.

4.3.4 Cluster 4: Community-minded retirees

Almost all members of this group are retired or semi-retired, highly active members of the community. All members of the group belonged to at least two community organisations and they were the most likely to be engaged in educational, religious, cultural and local community action

328   groups. The importance of being active in the community is reflected in this group's values. They

329   were the most likely to volunteer at least weekly and the majority of the group spend time with

330   other members of their community groups at least weekly as well as their friends and neighbours.

331   This group was most likely to rank the historic value of Browns River as being most important to

332   them.

333   **4.3.5   Cluster 5: Independent retirees**

334   The majority of this group were retired or semi-retired. This group is considered to be independent

335   because it had the highest number of members who lived alone and were the least likely to spend

336   time with family. Members of this group were most likely to have moved to Kingston Beach from

337   other parts of Tasmania or beyond. All members only belonged to one community organisation.

338   While this group was not as active in the community as the community-minded retirees, they were

339   the second most likely to volunteer and see community group members on at least a weekly basis.

340   This group was the least likely to engage in a range of physical activities, such as jogging, bike

341   riding, and going to the gym. However, they were the second most likely to rate the recreational

342   value of Kingston Beach as being very important to them.

343   **4.3.6   Cluster 6: Reclusive retirees**

344   This group mostly comprised retirees. This group is considered reclusive because they were not

345   involved in any community organisations and they were the least likely to volunteer, spend time

346   with members of community groups or see friends on a daily or weekly basis. The landscape

347   values of this group indicate that they do not value the beach and they were least likely to rate the

348   recreational or therapeutic value of Kingston Main Beach as being most important. However, they

349   were the most likely to value the therapeutic value of the Derwent River. The group also did not

350   place as much value on recreational opportunities, Kingston Beach being a safe place to live and

351   being unique for children as the other groups.

352

5 Discussion

354 The natural environment and relaxed lifestyle are important lived values to Kingston Beach

355 residents, whilst the landscape values mapping reveals that the Kingston Main Beach is of primary

356 importance. The cluster analysis shows the lived and landscape values are more salient to

357 particular groups within the community. It reveals that community engagement and social

358 interactions are highly valued by some members of the community, yet little is generally known

359 about where such interactions take place. The discussion that follows considers: 1) the extent to

360 which the lived and landscape values considered important in Kingston Beach are consistent with

361 past studies; 2) how integrating both values-based approaches may overcome limitations of each

362 method, but further work is required; and 3) the implications of these results for future adaptation

363 planning in comparable coastal communities that are threatened by sea-level rise.

5.1 Lived and landscape values in Kingston Beach

365 The lived values approach shows that residents of Kingston Beach place high importance on

366 values such as the natural environment, lifestyle and scenery – reflecting the unique combination

367 of water bodies, cliffs, bushland and wildlife. Comparing the lived values of Kingston Beach with

368 other studies in Australia reveals a number of similarities. Four of the five lived values rated as

369 most important in Kingston Beach — scenery, natural environment, relaxed lifestyle and feeling

370 safe — were ranked most important in Lakes Entrance, Victoria (Graham et al., 2014) and two of

371 the values—scenery and natural environment—were ranked most important in Botany Bay, New

372 South Wales, with safety ranked sixth (Kreller, 2016). Thus, across south-eastern Australia coastal

373 residents consistently value the physical landscape, relaxed lifestyle and a perceived sense of

374 safety. However, there are also clear place-based differences, with access to services being more

375 important in regional coastal areas (Graham et al., 2014) and access to transport and the city

376 being more important in larger urban localities (Kreller, 2016).

377 Landscape values mapping revealed that Kingston Main Beach is the most highly valued coastal

378 landscape, being most highly valued for recreational use, free of access restrictions and providing

379 a sense of identity. The landscape values mapping also revealed that the sea was important for its

380 aesthetic value, suggesting the importance of the sea to the 'scenery' lived value. Although the

381 importance of the coastline to recreation and aesthetics has been found in previous empirical

382 research, Novaczek et al. (2011) and Havas et al. (2016) found water itself to be as important, if

383 not more important, than the shoreline for recreation and aesthetic values. This difference between

384 Kingston Beach and other coastal landscapes internationally may reflect place-based differences

385 in the way residents interact with, and thus value, their coastal environment.

386 The cluster analysis helped to understand differences in lived and landscape values across the

387 Kingston Beach community. Of particular note is that for some residents such as the community-

388 minded retirees and reclusive retirees, recreational opportunity was a lived value of lessor

389 importance, also reflected in the lower landscape value they attributed to Kingston Main Beach

390 (Table 5). For the community-minded retirees, social interactions were important lived values and

391 they also appreciated the historic value of the Browns River. For reclusive retirees, there were few

392 lived values of importance to them but they did attach therapeutic value to the sea. Thus, the

393 cluster analysis showed that it is important to not only identify the lived and landscape values that

394 are rated as most important across the whole community, but also those that are specific to

395 particular groups. As per Graham et al. (2014) and Kreller (2016), the lived values that differ most

396 across the community are those that relate to being physically active, family-focused, engaged in

397 community organisations and maintaining social interactions. The landscape mapping approach

398 also revealed that groups of residents hold significantly different landscape values.

399 Overall, the survey results reveal that there is utility in asking residents to identify their lived and

400 landscape values. Together these two approaches provide a more comprehensive picture of *what*

401 residents' value and *how* those values are enacted in space. The cluster analysis showed the

402 value of seeking to understand within-community differences in lived and landscape values, i.e.

403 that consideration of *who* is also important. While the results are largely consistent with other

404 coastal values-based research, the differences that exist reveal the importance of understanding

405 local place attachments in adaptation planning.

5.2 Advancing the lived and landscape values mapping approaches

Both values-based approaches provide complementary information about the overarching social values at risk from sea-level rise. The lived values approach provides broader information about the values people associated with a place, whilst the landscape values mapping provides tangible associations with specific places. Yet, there are likely considerable benefits that could accrue from further integration of both approaches.

At a general level, the results of the landscape values mapping add detail to our understanding of the lived values of Kingston Beach, particularly with respect to the way in which the natural environment is valued. Graham et al. (2013) proposed that the natural environment can be considered to represent human "health" value, yet the landscape values mapping reveals that the natural environment is primarily valued for its recreation, access and identity values, which Graham et al. (2013) classify as "belonging" and "self-actualisation" values. While there may be some health and wellbeing benefits of recreating on the beach or being close to the water, this is not what is explicitly valued by residents and suggests that the lived values typology requires further theorisation. Thus, at a minimum, the lived values approach could be more specific in seeking to understand why particular lived values are important.

On the other hand, the lived values approach highlights missing values in the landscape values mapping approach. One of the key lived values of Kingston Beach residents, as well as residents in other Australian coastal communities, was feeling that it was a 'safe place to live' yet none of the nine values included in the typology here, nor the longer list of sixteen landscape values covered in other studies (Cole et al., 2015) consider safety as a social value. The other lived value that is often missing from landscape values mapping approaches is 'social interactions'. While lived values pertaining to social interactions were not ranked highly by residents in Kingston Beach in open or closed-questions, they were instrumental to understanding within-community differences in Kingston Beach and Lakes Entrance (Graham et al., 2014). Membership in community groups as well as interacting with family, friends and neighbours were defining features of clusters in both studies. Although 'social interactions and memories' were identified as important by Strickland-Munro et al. (2016) and included in their study of the landscape value of coastal waters in the

434   Kimberley, social interactions were not explicitly included as a landscape value covered in other

435   studies (Cole et al., 2015). While Strickland-Munro et al. (2015) acknowledge the importance of

436   family and friends, they do not explicitly consider the value of community groups. Thus the

437   landscape values mapping approach could be expanded to include social interactions and

438   concerns about safety to improve our understanding of how these social values are located in

439   geographic space and how they may be affected by climate change.

440   Beyond simply expanding the landscape values typology or being more specific in identification of

441   how particular physical landscape features are valued in the lived values approach, we argue that

442   there is potential to further integrate the two approaches to maximise their utility. At present, the

443   lived values approach begins through the use of place-based observations and interviews to

444   identify the most important place-specific health, safety, belonging, esteem and self-actualisation

445   lived values. There is no explicit consideration in this phase of the approach on identifying

446   important landscape features. The results of this study indicate that it is not only natural landscape

447   features that need to be identified, but also man-made infrastructure that may be where important

448   social interactions take place, such as community halls, churches and sports fields. Thus the first

449   stage of an integrated approach would be to identify the most important lived values for the whole

450   community, groups within the community who are more family-focused, physically active, socially

451   active, and reclusive, as well as important natural landscapes and man-made infrastructure.

452   The second phase of an integrated approach would involve a survey with a more specific list of

453   lived values and a more comprehensive list of 'landscape' values. The survey also needs to go

454   beyond targeting residents to include other people, such as tourists, who value the area. The

455   results of such a survey would be analysed using a form of cluster analysis, like the one used here,

456   to understand differences in lived and landscape values within and beyond the community. This

457   would provide policy makers with a much more comprehensive understanding of *what* aspects of

458   people's everyday lives would be affected by climate change (as per Graham et al., 2014), *where*

459   those values are located and *who* is most at risk.

460

461 **5.3   People and places at risk of sea-level rise: informing adaptation policy**

462 To illustrate how lived and landscape values data might be used to identify *what* lifestyle aspects

463 could be impacted, *where* those values are located and *who* is most at risk, we consider a sea-

464 level rise scenario in the study region that amongst other things has the potential to inundate

465 Kingston Main Beach. Overall impacts to the community would include loss of scenic amenity, loss

466 of natural environment and beach access for recreational amenity. Across community groups the

467 impacts of sea-level rise differs disproportionately depending on lived and landscape values (Table

468 6).

469

470 **Table 6** Impact of sea-level rise on the six clusters. Clusters with a higher percentage of the

471 variable impacted will be affected most (most affected cluster = -6; least affected cluster = -1).

	Variables impacted by sea-level rise	**Cluster 1:** Work-life balancing, families	**Cluster 2:** Physically-active, full-time workers	**Cluster 3:** Team-sports oriented residents	**Cluster 4:** Community minded retirees	**Cluster 5:** Independent retirees	**Cluster 6:** Reclusive retirees
Lived values	Recreational opportunities	-6	-4	-5	-2	-3	-1
	Safe place to live	-6	-5	-4	-3	-2	-1
	Unique place to raise children	-6	-4	-5	-2	-3	-1
Activities	Jogging opportunities	-4	-6	-5	-2	-1	-3
	Access the beach	-6	-5	-4	-3	-2	-1
Landscape values	Beach – recreation	-3	-6	-4	-2	-5	-1
	Beach – therapeutic	-4	-6	-5	-3	-2	-1
	Total	**-35**	**-36**	**-32**	**-17**	**-18**	**-9**

472

473 The illustration in Table 6 suggests that clusters made up of younger residents (e.g. clusters 1

474 through to 3) may have higher impacts to their lived values from rising sea-levels than retiree

475 clusters. We believe that the illustration presented in Table 6 provides a reasonable starting point

476 from which the council can begin incorporating social impacts from sea-level rise into adaptation

477 planning. Yet given the potential to further develop an integrated lived and landscape values

478 approach, we would recommend that further engagement occurs with the three groups of retirees

479 to understand if there are other lived and landscape values that may be at risk for these groups

480 and not identified through the survey (such as manmade infrastructure supporting social

481 interactions). Understanding what people within the community value about their everyday lives

482 and landscapes can help policy-makers engage with residents on coastal risks and steer policy-

483 makers towards designing fairer adaptation policies.

484 6 Conclusions

485 The methodology applied in this paper broadens the conceptualisation of coastal risk beyond

486 simply the physical impacts of inundation. The values-based impact assessment aligns to the 'risk

487 identification' step in risk management practice (ISO31000:2009) and can support deliberation with

488 stakeholders on climate risks and sensitive adaptation decisions (National Research Council,

489 2009:79).

490 Assisted by a detailed case study of a small coastal suburb in Tasmania, Australia, we find that the

491 information provided in the lived values and landscape values mapping approaches are

492 complementary in supporting climate change risk assessment and adaptation planning in coastal

493 areas. While the lived values approach is able to elicit a much larger set of values relating broadly

494 to the everyday lives of residents, the landscape values mapping provided a greater level of

495 precision on the type and significance of values associated with coastal areas. The high

496 importance placed on values relating to natural landscapes (i.e. scenery, natural environment),

497 which is becoming increasingly apparent in other studies around Australia, makes a strong case

498 for considering landscape values mapping information in adaptation planning.

499 The integration of lived values and landscape values mapping can advance values-based

500 approaches to climate change adaptation and highlight how groups of residents may be impacted

501 differently. Bringing these two approaches together means that policy-makers are equipped with

502 detailed information about *what* communities value about their everyday coastal lives, *where*

503 values are attributed to natural landscapes and man-made infrastructure, and for *whom* sea level

504 rise and other climate change impacts is likely to cause the greatest disruption – which can better

505 inform community risk assessments and adaptation responses in complex coastal environments.

506

References

508 Adger, W.N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D.R., Naess, L.O., Wolf,

509 J., Wreford, A., 2009. Are there social limits to adaptation to climate change? Clim. Chang. 93,

510 335-354. DOI http://dx.doi.org/10.1007/s10584-008-9520-z

511 Adger, N., Brown, K., Barnett, J., Marshall, N., O'Brien, K.L., 2013. Cultural dimensions of climate

512 change impacts and adaptation. Nat. Clim. Change 3, 112-117. DOI

513 http://dx.doi.org/10.1038/nclimate1666

514 Barnett, J., Fincher, B.R., Hurlimann, A., Graham, S., Mortreux, C., 2014a. Equitable local

515 outcomes in adaptation to sea-level rise: final project report. University of Melbourne, Victoria.

516 Barnett, J., Fincher, B.R., Hurlimann, A., Graham, S., Mortreux, C., 2014b. Incorporating

517 community values into climate change planning: a guide for government. University of Melbourne,

518 Victoria.

519 Baker, I., Peterson, A., Brown, G., McAlpine, C., 2012. Local government response to the impacts

520 of climate change: An evaluation of local climate adaptation plans. Landscape Urban Plan. 107,

521 127-136.

522 Brown, G., 2004. Mapping spatial attributes in survey research for natural resource management:

523 methods and applications. Soc. Nat. Resour. 18, 1-23. DOI

524 http://dx.doi.org/10.1080/08941920590881853

525 Brown, G., 2006. Mapping landscape values and development preferences: a method for tourism

526 and residential development planning. Int. J. Tour. Res. 8, 101-113. DOI

527 http://dx.doi.org/10.1002/jtr.562

528 Brown, G.G., Reed, P., 2012. Social Landscape Metrics: Measures for Understanding Place

529 Values from Public Participation Geographic Information Systems (PPGIS). Landsc. Res. 37, 73-

530 90. DOI http://dx.doi.org/10.1080/01426397.2011.591487

531 Brown, S., 2008. Telling stories: managing cultural values at Yuraygir National Park, Australia. In

532 Josep-Maria Mallarach (ed) Protected Landscapes and Cultural and Spiritual Values. IUCN, GTZ

533 and Obra Social de Caixa Catalunya, Kasparek Verlag, Heidelberg, 38-50.

534 Climate Planning, 2016. Kingston Beach Integrated Climate Change and Natural Hazards Project.

535 Climate Planning, Australia.

536 Cole, Z., Holland, S., Donohoe, H., 2015. A Social Values Typology for Comprehensive

537 Assessment of Coastal Zone Ecosystem Services. Soc. Nat. Resour. 28, 1290-1307. DOI

538 http://dx.doi.org/10.1080/08941920.2015.1020580

539 Dillman, D.A., 2007. Mail and Internet Surveys: The Tailored Design Method. John Wiley & Sons,

540 New York.

541 Gardam, J., 1988. Brown's River. A History of Kingston and Blackmans Bay. Rotary Club of

542 Kingston, Tasmania.

543 Graham, S., Barnett, J., Fincher, R., Hurlimann, A., Mortreux, C., Waters, E., 2013. The social

544 values at risk from sea-level rise. Environ. Impact Assess. Rev. 41, 45-52. DOI

545 http://dx.doi.org/10.1016/j.eiar.2013.02.002

546 Graham, S., Barnett, J., Fincher, R., Hurlimann, A., Mortreux, C., 2014. Local values for fairer

547 adaptation to sea-level rise: A typology of residents and their lived values in Lakes Entrance,

548 Australia. Glob. Environ. Chang. 29, 41-52. DOI http://dx.doi.org/10.1016/j.gloenvcha.2014.07.013

549 Havas, J., Saito, O., Hanaki, K., Tanaka, T., 2016. Perceived landscape values in the Ogasawara

550 Islands. Ecosyst. Serv. 18, 130-140. DOI http://dx.doi.org/10.1016/j.ecoser.2016.02.036

551 Karlsson, M., van Oort, B., Romstad, B., 2015. What we have lost and cannot become: societal

552 outcomes of coastal erosion in southern Belize. Ecol. Soc. 20, 4. DOI http://dx.doi.org/10.5751/ES-

553 07050-200104

554 Knight, R.I., 2016. Potential impacts of climate change on natural values of the Kingston Beach

555 area, Tasmania. Report to Kingsborough Council. Natural Resource Planning, Hobart.

556   Kreller, A., 2016. Pulling our heads out of the sand: understanding the value of fair sea-level rise

557   adaptation in Botany Bay. Bachelor of Social Research and Policy (Honours) thesis, University of

558   New South Wales, Sydney.

559   Kuruppu N., 2009. Adapting water resources to climate change in Kiribati: the importance of

560   cultural values and meanings. Environ. Sci. Pol. 12, 799-809. DOI

561   http://dx.doi.org/10.1016/j.envsci.2009.07.005

562   McInnes, K. L., Monselesan, D., O 'Grady, J., Church, J., Zhang , X., 2016. Sea-Level Rise and

563   Allowances for Tasmania based on the IPCC AR5. Report for the Tasmanian Department of

564   Premier and Cabinet. CSIRO, Australia.

565   National Research Council, 2009. Informing decisions in a changing climate. Panel on Strategies

566   and Methods for Climate-Related Decision Support. The National Academies Press, Washington

567   D.C.

568   Nielsen J., Reenberg A., 2010. Cultural barriers to climate change adaptation: a case study from

569   Northern Burkina Faso. Glob. Environ. Chang. 20, 142-52. DOI

570   http://dx.doi.org/10.1016/j.gloenvcha.2009.10.002

571   Novaczek, I., MacFadyen, J., Bardati, D., MacEachern, K., 2011. Social and Cultural Values

572   Mapping as a Decision-Support Tool for Climate Change Adaptation. The Institute of Island

573   Studies, University of Prince Edward Island, Charlottetown, Canada.

574   O'Brien, K.L., Wolf, J., 2010. A values-based approach to vulnerability and adaptation to climate

575   change. Wiley Interdiscip. Re. Clim. Change, 1, 232-242. DOI http://dx.doi.org/10.1002/wcc.30

576   Persson, J., Sahlin, N., Wallin, A., 2015. Climate change, values, and the cultural cognition thesis.

577   Environ. Sci. Pol. 52, 1-5. DOI http://dx.doi.org/10.1016/j.envsci.2015.05.001

578   Plieninger, T., Dijks, S., Oteros-Rozas, E., Bieling, C., 2013. Assessing, mapping, and quantifying

579   cultural ecosystem services at community level. Land Use Policy. 33, 118-129.

580   Raymond, C.M., Brown, G., 2011. Assessing spatial associations between perceptions of

581   landscape value and climate change risk for use in climate change planning. Clim. Chang. 104,

582   653-678. DOI http://dx.doi.org/10.1007/s10584-010-9806-9

583   Sharples, C., Donaldson, P., 2014. A first pass coastal hazard assessment for Kingborough Local

584   Government Area, Tasmania. Report to Kingborough Council. Blue Wren Group and University of

585   Tasmania, Tasmania.

586   Strickland-Munro, J., Kobryn, H., Brown, G., Moore, S.A., 2016. Marine spatial planning for the

587   future: Using Public Participation GIS (PPGIS) to inform the human dimension for large marine

588   parks. Mar. Policy. 73, 15-26. DOI http://dx.doi.org/10.1016/j.marpol.2016.07.011

589   Tyrväinen, L., Mäkinen, K., Schipperijn, J., 2007. Tools for mapping social values of urban

590   woodlands and other green areas. Landscape Urban Plan. 79, 5-19. DOI

591   http://dx.doi.org/10.1016/j.landurbplan.2006.03.003

592   Wolf, J., Allice, I., Bell, T., 2013. Values, climate change, and implications for adaptation: Evidence

593   from two communities in Labrador, Canada. Glob. Environ. Chang. 23, 548-562. DOI

594   http://dx.doi.org/10.1016/j.gloenvcha.2012.11.007

595

Vitae

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612 **Appendix A – Survey materials**

613   The appendix contains the following information relating to the survey:

614   1. Place-based observations form

615   2. Semi-structured interview questions

616   3. Survey questions

617

Place-based observations form

618

Date	Start time	End time	Observed by
_____	_____	_____	_____

619

Weather	Hobart (Stn ID 094029)	Dennes Point (Stn ID 094255)
Temperature	_____	_____
Wind Speed	_____	_____
Wind Direction	_____	_____

Weather (on site)

☐ Sunny   ☐ Partly cloudy

☐ Overcast   ☐ Rainy

Wind (on site)

☐ Clam   ☐ Light winds   ☐ Moderate   ☐ Gale

☐ Fresh winds   ☐ Strong winds   ☐ Near gale

Approx swell/wave height _____

620

Location (as marked on map – attached)

☐ Esplanade   ☐ Dog Beach   ☐ Browns River   ☐ Other _____

☐ Kingston Beach   ☐ Boat Ramp   ☐ Boronia Beach

621

622   **[Note:** Place the **number of people** observed in the sections below**]**

623 **Kingston Beach Esplanade** (behind sea wall)

Activity	Adults	Children	Activity	Adults	Children
BBQ	_____	_____	Picnic	_____	_____
Bike riding	_____	_____	Sitting (car or bench)	_____	_____
Café / Dining	_____	_____	Walking	_____	_____
Dog walking	_____	_____	_____	_____	_____
Jogging	_____	_____	_____	_____	_____

624

625 **Notes**

626 _____

627 _____

628 _____

_____

629 **Kingston Beach** (sand; excludes dog beach)

Activity	Adults	Children	Activity	Adults	Children
BBQ	_____	_____	Playing (sand)	_____	_____
Beach volleyball	_____	_____	Sitting	_____	_____
Paddle / body board	_____	_____	Surf lifesaving	_____	_____
Fishing	_____	_____	Swimming / Wading	_____	_____
Jogging	_____	_____	Walking	_____	_____
Kayaking / canoe	_____	_____	_____	_____	_____
Picnic	_____	_____	_____	_____	_____
Play equipment	_____	_____	_____	_____	_____

630 **Notes**

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633

634 **Dog Beach – Tyndall / Kingston Beach** (sand; south of Browns River foot bridge)

Activity	Adults	Children	Activity	Adults	Children
Dog walking	_____	_____	Playing (sand)	_____	_____
Fishing	_____	_____	Sitting	_____	_____
Jogging	_____	_____	Swimming / Wading	_____	_____
Kayaking / canoe	_____	_____	Walking	_____	_____
Picnic	_____	_____	_____	_____	_____

635 **Notes**

636 _____

637 _____

638

639 **Boat Ramp / Breakwater**

Activity	Adults	Children	Activity	Adults	Children
Boating	_____	_____	Sitting	_____	_____
Café	_____	_____	Walking	_____	_____
Fishing	_____	_____	_____	_____	_____
Sailing	_____	_____	_____	_____	_____

640 **Notes**

641 _____

642 _____

643 **Browns River** (riverbank and flood plain)

Activity	Adults	Children	Activity	Adults	Children
BBQ	_____	_____	Kayaking / canoe	_____	_____
Bike riding	_____	_____	Picnic	_____	_____
Dog walking	_____	_____	Play equipment	_____	_____
Duck feeding	_____	_____	Sitting	_____	_____
Golf	_____	_____	Walking	_____	_____
Fitness equipment	_____	_____	_____	_____	_____
Jogging	_____	_____	_____	_____	_____

644 **Notes**

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646 _____

_____

647

648 **Boronia Beach** (and walking track)

Activity	Adults	Children	Activity	Adults	Children
Dog walking	_____	_____	Swimming / Wading	_____	_____
Jogging	_____	_____	Walking	_____	_____
Sitting	_____	_____	_____	_____	_____

649 **Notes**

650 _____

651 _____

_____

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654   **Map of Kingston Beach area – observations and sketches**

655

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Semi-structured interview questions

Introductory

1. How long have you lived in Kingston Beach?
   a. [x years] Why did you choose to live here?
   b. [All my life/since childhood] How long was your family here for? What brought them here originally?
   c. What makes you stay here?
   d. Do you intend to continue living here?

Everyday life (lived values)

The next two questions are designed to get an understanding of people's everyday lives. What

they do, who they interact with and the places they spend time. With that in mind:

2. Please describe the main activities you can recall undertaking yesterday/last Friday (if interview is conducted Tuesday-Friday/Monday) including where each activity occurred, with whom and the amount of time you spent performing each one. The order in which you undertook these activities is not important.
   a. *Contracted time:* What paid work or study did you engage in?
   b. *Committed time:* What household tasks, shopping, food preparation or care (children or others) did you engage in?
   c. *Leisure:* What leisure and social activities did you engage in?

3. *Weekends:* Please describe the main activities you can recall undertaking last Saturday including where each activity occurred, with whom and the amount of time you spent performing each one. The order in which you undertook these activities is not important.
   a. *Contracted time:* What paid work or study did you engage in?
   b. *Committed time:* What household tasks, shopping, food preparation or care (children or others) did you engage in?
   c. *Leisure:* What leisure and social activities did you engage in?

Place attachment (place-based values)

For the next set of questions, please think specifically about the Kingston Beach area.

4. In addition to (any) places you mentioned previously, are there any other places that you spend time in in Kingston Beach?

5. Are any of the places you have mentioned in some way special to you?
   a. For what reasons?

695 6. How would you compare Kingston Beach with other places you have lived in/travelled
696   through?
697   a. <u>Health:</u> Are there things that you need that you can't get here?
698   b. <u>Safety:</u> Do you feel safe and secure?
699   c. <u>Belongingness:</u> Do you feel like you belong here?
700   d. <u>Esteem:</u> Do you feel like you are a respected member of the community?
701   e. <u>Self-actualisation:</u> Does living here make you feel good about yourself?

702 7. Does anything frustrate you about living here? (or need improving)
703

704 8. If you could wave a magic wand what changes would you like to make to Kingston Beach?
705   a. What if money was no issue?
706

707 9. Overall, what would you say you value most about living here?
708   a. What are the most important aspects to your daily life?
709

710 **Values assigned to natural coastal areas**
711 For the next set of questions, please think specifically about natural coastal areas:
712

713 10. [Show a map of coast/explain where map is] Please identify what natural coastal areas you
714   value on this map (for any reason)? (talk about these areas)
715

716 11. [Show list of values assigned to coastal resources] From the list of values, which ones are
717   most important to you or resonate with you about the coastal natural areas mentioned? (up
718   to 10 values)
719   a. What ones do you associate with the areas mentioned above?
720

721 12. [Show map to be used in survey] Are there any places shown on this map that are essential
722   to your decision to stay in Kingston Beach, without which you would consider relocating?
723

724

725 **Changing natural hazards**

726 For the next set of questions, consider a possible scenario of sea level rise and/or increase
727 flooding of Browns River:
728

729 13. Do you think that increased coastal flooding (more frequent) would affect your ability to
730   enjoy the places you spend time in?
731   a. What would be your concerns (or disruptions) to your way of life?
732

733 14. Have you ever experienced flooding (coastal or riverine) in Kingston Beach?
734   a. **[Yes]** Were there any impacts to your way of life?
735   i. If a similar event became more frequent, at what point would you consider
736   taking action to protect your home or other areas?
737   b. **[No]** Consider a scenario that floods parts of Beach Road and Osborne Esplanade
738   for 12 hours (show on map).
739   i. What do you think the impacts might be to your lifestyle?
740   ii. What frequency of this type of flood would prompt you consider taking action
741   to protect your home or other natural coastal areas?
742
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748 15. Consider Kingston Beach and the Dog Beach. Please consider whether the following
749   scenarios might impact on your lifestyle:
750   a. More frequent erosion events on the beach (temporary loss of area)?
751   b. The beach only being accessible at low tide?
752   c. Complete loss of the beach?
753   d. [If important] At what point would you consider action to protect the beach?
754
755 16. Where do you get information about flood risk in the area?
756
757 17. Who do you think is responsible for managing flood risk in the area, to protect built and
758   natural areas from loss and damage?
759
760
761 **<u>Wrap up</u>**

762 18. For the purposes of making sure we have a broad representation of the community:
763   a. Are you a member of any social groups? *[Prompts: religious, sporting, local*
764   *associations?]*
765   b. How old are you?
766   c. What is the highest level of education that you have achieved?
767   d. How many people usually live in your household?
768   e. [Gender by observation]
769
770 19. Would you prefer a questionnaire in hardcopy form or as a web-based survey?
771
772 20. Do you have any further comments?
773
774
775

Values List for Natural Coastal Areas

Value	Definition
Access	I value these places because they are common property, free from access restrictions of exclusive ownership/control.
Aesthetic	I value these places for the enjoyable scenery, sights, sounds and smells.
Biodiversity	I value these places for the variety and abundance of fish, birds, wildlife and plant life.
Cultural	I value these places for passing down wisdom, knowledge and traditions.
Economic	I value these places for tourism, fisheries (commercial/recreational) and other business.
Future	I value these places because future generations can know and experience healthy, productive, and sustainable ecosystems.
Historic	I value these places for the natural and human history that matter to individuals, communities, societies and nations.
Identify/ symbolic	I value these places because they engender a sense of place, community and belonging.
Intrinsic	I value these places because they exist, no matter what others think about them or how we use them.
Learning	I value these places for the educational value.
Life sustaining	I value these places because they help produce, support and preserve human and natural life.
Recreation	I value these places because they provide outdoor recreation activities.
Spiritual / novel experience	I value these places as sacred, religious, unique, and/or profound experiences where respect for nature is felt.
Subsistence	I value these places because they provide basic human needs.
Therapeutic	I value these places because they enhance feelings of wellbeing (an escape, stress relief, comfort and calm).
Natural	I value these places because of minimal human impact and/or intrusion on the natural environment.

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780 # Survey questions

781 ## SECTION 1: Thinking about when you moved to Kingston Beach
782
783 **1. How many years have you been living in the Kingston Beach suburb?** _____ *(years)*
784
785 **2. Have you lived in Kingston Beach all of your life?** *(Please tick one)*
786   ❑ Yes → **go to question 5**
787   ❑ No
788
789 **3. Did your family have any connection to the area before you moved to Kingston Beach?**
790 *(Please tick one)*
791   ❑ Yes
792   ❑ No
793
794 **4. Where did you live immediately before moving to Kingston Beach?** *(Please tick one)*
795   ❑ Another suburb in Hobart
796   ❑ Another suburb/town in Tasmania (not in Hobart)
797   ❑ Another suburb/town <u>outside</u> Tasmania
798

SECTION 2: Thinking about your decision to live in Kingston Beach

5. What is <u>most important</u> to you about living in Kingston Beach?

6. How important are the following aspects to your <u>daily</u> life in Kingston Beach? *(Place a tick in the appropriate box for each item listed)*

	Very Important	Important	Not important
Natural environment	❑	❑	❑
Relaxed lifestyle	❑	❑	❑
Peacefulness	❑	❑	❑
The bird life	❑	❑	❑
A flat landscape	❑	❑	❑
Easy to get to places	❑	❑	❑
A unique place for children to grow up	❑	❑	❑
A safe place to live	❑	❑	❑
Financially secure / affordability	❑	❑	❑
Friendly people / community feel	❑	❑	❑
Being close to family	❑	❑	❑
Being close to friends	❑	❑	❑
Location (close to the water)	❑	❑	❑
The scenery (and views)	❑	❑	❑
Easy access to the beach	❑	❑	❑
Ambience / atmosphere	❑	❑	❑
Recreational opportunities	❑	❑	❑

7. Please describe anything else not mentioned in the previous question that is <u>very important</u> for choosing to live in Kingston Beach?

829 **8. Do any of the following things frustrate you about living in Kingston Beach?** *(Place a tick*
830 *in the appropriate box for each item listed)*
831

	Yes	No
Local council decision-making	❑	❑
Limited entertainment options	❑	❑
Limited activities for youth	❑	❑
Limited park areas	❑	❑
Limited number of footpaths	❑	❑
Limited number of shops	❑	❑
Poor quality of roads	❑	❑
Vehicle traffic along the esplanade	❑	❑
Flood management of Browns River	❑	❑
Limited public transport services	❑	❑
Peak hour congestion on the Southern Outlet	❑	❑
Other *(please specify)*: _____	❑	❑

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835 # SECTION 3: Thinking about how you spend your time
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837 **9. How <u>often</u> do you do each of the following activities in the suburb?** *(Place a tick in the*
838 *appropriate box for each item listed)*
839

	Every day	Every week	Every month	Rarely	Never
Go for a walk	❑	❑	❑	❑	❑
Walk the dog	❑	❑	❑	❑	❑
Visit the cafes / restaurants	❑	❑	❑	❑	❑
Visit local shops	❑	❑	❑	❑	❑
Access the beach	❑	❑	❑	❑	❑
Use picnic areas and benches	❑	❑	❑	❑	❑
Visit nearby parks / play equipment	❑	❑	❑	❑	❑
Go kayaking / paddle boarding	❑	❑	❑	❑	❑
Ride a bike	❑	❑	❑	❑	❑
Go for a jog	❑	❑	❑	❑	❑
Go swimming	❑	❑	❑	❑	❑
Go to the gym	❑	❑	❑	❑	❑
Play golf	❑	❑	❑	❑	❑
Go fishing	❑	❑	❑	❑	❑
Go boating	❑	❑	❑	❑	❑
Go sailing	❑	❑	❑	❑	❑
Do volunteer work	❑	❑	❑	❑	❑
Other *(please specify)*: _____	❑	❑	❑	❑	❑

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SECTION 4: Thinking about how you value coastal areas

10. How important are the following values to you when thinking about the <u>beach</u> in the suburb? *(Place a tick in the appropriate box for each item listed)*

Value / Definition	Very Important	Important	Not Important
Access: *Common property, free from access restrictions or exclusive ownership*	❏	❏	❏
Aesthetic: *Enjoyable scenery, sights, sounds and smells*	❏	❏	❏
Biodiversity: *Variety and abundance of fish, birds, animals and plant life*	❏	❏	❏
Future: *Future generations can experience healthy, productive, and sustainable ecosystems*	❏	❏	❏
Historic: *Natural and human history that matters to individuals and communities*	❏	❏	❏
Identify/ symbolic: *Sense of place, community and belonging*	❏	❏	❏
Recreation: *Providing enjoyable outdoor recreation activities*	❏	❏	❏
Therapeutic: *Enhanced feelings of wellbeing (e.g. stress relief, comfort and calm)*	❏	❏	❏
Natural: *Minimal human impact or intrusion on the natural environment*	❏	❏	❏

11. Please list any other values not shown in the question above that are <u>important</u> to you when thinking about the beach.

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The map below shows <u>coastal</u> areas in Kingston Beach, identified with letters A through to H. Please use this map for **questions 12 and 13.**

(A) SALTMARSH

(B) SALINE GRASSLAND (INCL. GOLF COURSE)

(C) BROWNS RIVER

(D) DOG BEACH (INCL. TYNDALL BEACH)

(E) KINGSTON MAIN BEACH

(F) SEA (DERWENT RIVER)

(G) ROCKY SHORE

(H) BORONIA BEACH

UNIVERSITY of TASMANIA

12. For each 'value' shown in the table below, please choose <u>up to 3</u> coastal areas that are important to you because of that value. The coastal areas should be numbered in order of importance (i.e. 1 = most important, 2 = second, 3 = third). If the value is not important to you, leave that row empty.

EXAMPLE

If you value the <u>Sea</u> most of all for **'access'**, then <u>Kingston main Beach</u>, then <u>Browns River</u>, you would do the following:

Value	Coastal Area (see map)							
	(A) Saltmarsh	**(B)** Saline grassland / golf course	**(C)** Browns River	**(D)** Dog Beach	**(E)** Kingston main Beach	**(F)** Sea (Derwent River)	**(G)** Rocky Shore	**(H)** Boronia Beach
Access: *Common property, free from access restrictions or exclusive ownership*	❑	❑	❸	❑	❷	❶	❑	❑

(For each row in the table, number up to 3 coastal areas in order of importance)

Value	Coastal Area *(refer to map)*							
	(A) Saltmarsh	**(B)** Saline grassland / golf course	**(C)** Browns River	**(D)** Dog Beach	**(E)** Kingston main Beach	**(F)** Sea (Derwent River)	**(G)** Rocky Shore	**(H)** Boronia Beach
Access: *Common property, free from access restrictions or exclusive ownership*	❑	❑	❑	❑	❑	❑	❑	❑
Aesthetic: *Enjoyable scenery, sights, sounds and smells*	❑	❑	❑	❑	❑	❑	❑	❑
Biodiversity: *Variety and abundance of fish, birds, animals and plant life*	❑	❑	❑	❑	❑	❑	❑	❑
Future: *Future generations can experience healthy, productive, and sustainable ecosystems*	❑	❑	❑	❑	❑	❑	❑	❑
Historic: *Natural and human history that matters to individuals and communities*	❑	❑	❑	❑	❑	❑	❑	❑
Identify/ symbolic: *Sense of place, community and belonging*	❑	❑	❑	❑	❑	❑	❑	❑
Recreation: *Providing enjoyable outdoor recreation activities*	❑	❑	❑	❑	❑	❑	❑	❑
Therapeutic: *Enhanced feelings of wellbeing (e.g. stress relief, comfort and calm)*	❑	❑	❑	❑	❑	❑	❑	❑
Natural: *Minimal human impact or intrusion on the natural environment*	❑	❑	❑	❑	❑	❑	❑	❑

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13. Referring again to the map, how <u>often</u> do you use the following areas for <u>recreational</u> activities? *(Place a tick in the appropriate box for each item listed)*

Letter	Coastal Area	Every day	Every week	Every month	Rarely	Never
A	Saltmarsh	❑	❑	❑	❑	❑
B	Saline grassland (incl. golf course)	❑	❑	❑	❑	❑
C	Browns River	❑	❑	❑	❑	❑
D	Dog Beach	❑	❑	❑	❑	❑
E	Kingston Main Beach	❑	❑	❑	❑	❑
F	Sea (Derwent River)	❑	❑	❑	❑	❑
G	Rocky shore	❑	❑	❑	❑	❑
H	Boronia Beach	❑	❑	❑	❑	❑

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SECTION 5: Thinking about flooding events

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14. Where do you get information about flooding <u>risk</u> in Kingston Beach? *(Please tick as many that apply)*

924 ❑ Council reports and displays   ❑ Printed media (newspaper, magazine)
925 ❑ Radio   ❑ Word of mouth / experience in the area
926 ❑ Online (social media, internet)   ❑ I don't know
927 ❑ Scientific journals or magazines   ❑ Other: _____
928 ❑ Television

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15. Who do you think is <u>responsible</u> for minimising flood risk in Kingston Beach? *(Please tick as many that apply)*

932 ❑ Local government (Council)   ❑ Individual residents
933 ❑ State government   ❑ I don't know
934 ❑ Federal government (Commonwealth)   ❑ Other: _____

935
936

16. Have you ever experienced a major flooding event which has caused parts of <u>your</u> property to be under water? *(Please tick one)*

938 ❑ Yes
939 ❑ No

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941

17. To what extent do you think that increased flooding risk could affect the following things in Kingston Beach? *(Place a tick in the appropriate box for each item listed)*

943

	Definite Impact	Possible Impact	No Impact	Don't know
My everyday lifestyle	❑	❑	❑	❑
The beach	❑	❑	❑	❑
The value of my house	❑	❑	❑	❑
Feeling safe in my house	❑	❑	❑	❑
Getting insurance for my house	❑	❑	❑	❑
My annual rate and insurance premium costs	❑	❑	❑	❑
Emergency access via Beach Road	❑	❑	❑	❑
The natural environment	❑	❑	❑	❑

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18. Consider a hypothetical scenario where the beach was lost to sea level rise. Would you consider <u>moving</u> to another suburb? *(Please tick one)*
- ❑ Yes
- ❑ No
- ❑ I don't know

19. What are your council rates each <u>year</u> (estimated)? If you rent, please estimate this amount.

_____ *(dollars per year)*

20. Council rates are spent on important services such as waste management and infrastructure. If the risk of flooding from Browns River to your house or public infrastructure increased, would you like to see money spent on activities to reduce flood risk? Currently about 3% of rates is currently spent on natural resource management across the municipality. *(Please tick as many that apply)*
- ❑ Yes – using a separate rate / extra rent
- ❑ Yes – using a larger proportion of my existing rate → **<u>(go to question 23)</u>**
- ❑ No → **<u>(go to question 25)</u>**

21. If the risk of flooding from Browns River increased, what <u>extra</u> rate on top of your existing rate would you consider paying to manage flood risk? If you rent, please state an additional rental amount.

_____ *(dollars per year)*

22. If the beach was hypothetically lost to sea level rise, would you change your answer to the above question (i.e. the amount you would pay to reduce flood risk)?
- ❑ No
- ❑ Yes *(please specify the new amount)*: _____ *(dollars per year)*

*If you would not want to use a larger proportion of your existing rate to manage flood risk (in addition to a separate rate), go to **question 25**.*

23. If the risk of flooding from Browns River increased, what <u>percentage</u> of your annual rates would you like to see allocated to managing flood risk? *Remember that this amount will no longer be available for other services which would have to be cut.*

_____ (% of annual rates)

24. If the beach was hypothetically lost to sea level rise, would you change your answer to the above question (i.e. the allocation of rates to manage flood risk)?
- ❑ No
- ❑ Yes *(please specify the new amount)*: _____ (% of annual rates)

SECTION 6: Thinking about your personal connections

25. How often do you spend time with the following people? *(Place a tick in the appropriate box for each item listed)*

	Every day	Every week	Every month	Rarely	Never
Immediate family	❑	❑	❑	❑	❑
Friends	❑	❑	❑	❑	❑
Neighbours (not counted as friends above)	❑	❑	❑	❑	❑
Work colleagues outside work	❑	❑	❑	❑	❑
Members of groups or organisations that you belong to	❑	❑	❑	❑	❑
Other members of the community	❑	❑	❑	❑	❑

26. Close friends are people you feel at ease with, can talk to about private matters or call on for help. How many of your close friends live in Kingston Beach? *(Please tick one)*
- ❑ None
- ❑ One
- ❑ A few
- ❑ A lot

27. Are you involved in any of the following organisations in your suburb? *(Place a tick in the appropriate box for each item listed)*

	Yes	No
Service organisation (e.g. Rotary, Emergency Services)	❑	❑
Religious or church organisations	❑	❑
Education organisations	❑	❑
Arts, music or cultural organisations	❑	❑
Youth organisations (e.g. Scouts)	❑	❑
Local community action groups	❑	❑
Conservation or environmental groups	❑	❑
Sports or recreation groups (e.g. sailing, dog walking)	❑	❑
Other *(please specify)*: _____		

SECTION 7: Thinking about you and your household

28. Are you male or female? *(Please tick one)*
- ❑ Female
- ❑ Male
- ❑ Other

29. Does anyone in your household identify as being Aboriginal or Torres Strait Islander? *(Please tick one)*
- ❑ Yes
- ❑ No

30. What age group do <u>you</u> fall into? *(Please tick one)*
- ❑ 18-24   ❑ 55-64
- ❑ 25-34   ❑ 65-74
- ❑ 35-44   ❑ 75-84
- ❑ 45-54   ❑ 85 and older

31. How many people usually live in your house including you? _____ *(people)*

32. Is anyone in your house dependent on the care of someone else? *(Please tick one)*
- ❑ Yes
- ❑ No

33. Which of the following best describes your household? *(Please tick one)*
- ❑ Single person household   ❑ Extended family
- ❑ Single with child/children   ❑ Share house
- ❑ Couple   ❑ Other
- ❑ Couple with child/children

34. Do you own at least <u>one</u> dog? *(Please tick one)*
- ❑ Yes
- ❑ No

35. What is your gross (before tax) weekly <u>household</u> income? *(Please tick one)*
- ❑ Nil
- ❑ $1 – $399 per week ($1 - $20,749 annually)
- ❑ $400 – $999 per week ($20,800- $51,949 annually)
- ❑ $1,000 – $1,999 per week ($52,000 - $103,950 annually)
- ❑ $2,000 or more per week ($104,000 or more annually)
- ❑ Rather not say
- ❑ Don't know

36. Is your home in Kingston Beach your main residence or second home (i.e. holiday house)? *(Please tick one)*
- ❑ Main residence
- ❑ Second home or holiday house

37. Which of the following best describes you? *(Please tick one)*
- ❑ Renting my house
- ❑ Own my house <u>without</u> a mortgage ➔ **(go to question 39)**
- ❑ Own my house with a mortgage

38. Do you have <u>greater</u> than 30% of your gross weekly <u>household</u> income going to mortgage repayments or rent for your main residence? *(Please tick one)*
- ❑ Yes
- ❑ No
- ❑ Rather not say
- ❑ I don't know

39. What type of insurance cover do you have for your main residence? *(Please tick one)*
- ❑ Home and contents
- ❑ Contents only
- ❑ None → **(go to question 41)**
- ❑ Rather not say
- ❑ I don't know

40. Does the insurance policy for your main residence cover flooding from Browns River? *(Please tick one)*
- ❑ Yes
- ❑ No
- ❑ Rather not say
- ❑ I don't know

41. What is the highest level of education that you have completed? *(Please tick one)*
- ❑ University degree or higher
- ❑ TAFE or other vocational certificate
- ❑ Year 12, TCE or equivalent
- ❑ Year 11, or equivalent
- ❑ Year 10 or below
- ❑ Did not go to school

42. Which would best describe your situation with regard to work, study or caring responsibilities? *(Please tick as many that apply)*
- ❑ Working full-time
- ❑ Working part-time
- ❑ Looking for work
- ❑ Studying full-time
- ❑ Studying part-time
- ❑ Caring for children
- ❑ Caring for others
- ❑ Retired
- ❑ Semi-retired
- ❑ Not working and not looking for work
- ❑ Not working due to an injury/illness/disability
- ❑ Other

43. Do you own your own business? *(Please tick one)*
- ❑ Yes
- ❑ No

Appendix B – Definition of social values used in landscape mapping

A definition of the typology of nine values, in the survey, based upon Cole et al., (2015), are shown in Table B.1.

Table B.1: Typology of social values used for landscape mapping and their operational definition

Value	Operational Definition
Access	Common property, free from access restrictions or exclusive ownership
Aesthetic	Enjoyable scenery, sights, sounds and smells
Biodiversity	Variety and abundance of fish, birds, animals and plant life
Future	Future generations can experience healthy, productive, and sustainable ecosystems
Historic	Natural and human history that matters to individuals and communities
Identify/ symbolic	Sense of place, community and belonging
Recreation	Providing enjoyable outdoor recreation activities
Therapeutic	Enhanced feelings of wellbeing (e.g. stress relief, comfort and calm)
Natural	Minimal human impact or intrusion on the natural environment

Other landscape values from Cole et al. (2015) not included in the survey were:

1. Cultural – passing down wisdom, knowledge and traditions

2. Economic – tourism, fisheries and other business

3. Intrinsic – place just exists

4. Learning – educational value

5. Life sustaining – produce, support and preserve human and natural life

6. Spiritual / novel experience – sacred, religious, unique and/or profound experiences where respect for nature is felt

7. Subsistence – provide basic human needs

Appendix C – Lived values identified in open ended questions

1135 Detailed information about the open-ended survey questions are provided in Table C.1. The values

1136 have been categorised by health, safety, belongingness, esteem and self-actualisation to be

1137 consistent with Graham et al. (2013; based on Maslow's Hierarchy of needs) and rank in each

1138 category from highest to lowest.

1139 **Table C.1.** Lived values identified by survey respondents in the suburb of Kingston Beach in

1140 response to open-ended questions (Q5 and Q7) about what they value most about where they live.

1141 Numbers in bold are the top five lived values mentioned and values marked with an asterisk (*)

1142 were shortlisted in the closed survey question (Q6). Values identified in the semi-structured

1143 interview and also in the Lakes Entrance case study (Graham et al., 2015)[2] are shown.

Lived Value Category	Lived values	Semi-structured interview	Lakes Entrance (Australia)	Kingston Beach (suburb)
Health	Easy to get to places *(proximity to city, shops and other valued places)* *	✓	✓	**112 (34.8%)**
	A flat landscape *	✓		18 (5.6%)
	Public transport			10 (3.1%)
	Close to work	✓	✓	9 (2.8%)
	Convenience		✓	9 (2.8%)
	Clean environment and air		✓	8 (2.5%)
	Good cafes / restaurants			7 (2.2%)
	Weather / climate	✓	✓	6 (1.9%)
	Good parking options			2 (0.6%)
	Good cycle options			2 (0.6%)
	Smaller house or land (downsizing) *	✓		1 (0.3%)
Safety	Peacefulness *(and quiet)* *	✓	✓	31 (9.6)
	A safe place to live *(feeling of)* *	✓	✓	12 (3.7%)
	Financially secure / affordability *	✓	✓	7 (2.2%)
	Employment opportunities		✓	2 (0.6%)
	Privacy		✓	1 (0.3%)

[2] Graham, S., Barnett, J., Fincher, R., Mortreux, C., Hurlimann, A., 2015. Towards fair local outcomes in adaptation to sea-level rise. Clim. Change, 130, 411-424.

Lived Value Category	Lived values	Semi-structured interview	Lakes Entrance (Australia)	Kingston Beach (suburb)
	Medical facilities / services		✓	1 (0.4%)
Belongingness	The beach *(and proximity)* / Easy access to the beach *	✓	✓	**118 (36.6%)**
	The scenery (and views) *(outlook)* *	✓	✓	**83 (25.8%)**
	Natural environment *	✓	✓	**46 (14.3%)**
	Friendly people / community feel *	✓	✓	37 (11.5%)
	Location *(close to water)* *	✓	✓	33 (10.2%)
	Being close to family *	✓	✓	14 (4.3%)
	Pet friendly community / dog exercise areas			13 (4.0%)
	Close to the bush			10 (3.1%)
	Individual heritage / family history	✓	✓	6 (1.9%)
	The sounds (sea)		✓	4 (1.2%)
	Local church community			3 (0.9%)
	The wildlife		✓	3 (0.9%)
	Being close to friends *	✓	✓	2 (0.6%)
	Local golf club (Kingston Beach Golf Club)			2 (0.6%)
	Green places *(open spaces)*			1 (0.3%)
	Close to mountain (Mt Wellington)		✓	1 (0.3%)
	Friend visits		✓	1 (0.3%)
Esteem	House / land attributes			17 (5.3%)
	Sense of space			4 (1.2%)
	Beachfront streetscape			1 (0.3%)
	Pride			1 (0.3%)
Self-actualisation				
	Relaxed lifestyle *(beach lifestyle)* *	✓	✓	**45 (14.0%)**
	Ambience / atmosphere *(character)* *	✓	✓	32 (9.9%)
	Recreation opportunities *	✓	✓	30 (9.3%)
	Low housing density / not congested or developed		✓	11 (3.4%)
	A unique place for children to grow up *(great place to raise a family)* *	✓	✓	5 (1.6%)
	Away from the city		✓	3 (0.9%)
	Quality of life		✓	1 (0.3%)
			Total	45

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