

1 **ARTICLE TITLE:**

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

3

4 **AUTHORS:**

5 Timothy David Ramm ^{a, b}, Sonia Graham ^c, Christopher John White ^{a, d, e}, Christopher Stephen

6 Watson ^f

7

8 **AFFILIATIONS:**

9 a. School of Engineering and ICT, University of Tasmania, Hobart, Australia

10 b. Bushfire and Natural Hazards Cooperative Research Centre, Melbourne, Australia

11 c. School of Social Sciences, University of New South Wales, Sydney, Australia

12 d. Antarctic Climate and Ecosystems Cooperative Research Centre, Hobart, Australia

13 e. European Centre for Environment and Human Health, University of Exeter, Truro, UK

14 f. School of Land and Food, University of Tasmania, Hobart, Australia

15

16 **CORRESPONDING AUTHOR:**

17 **Name:** Timothy Ramm

18 **E-mail:** timothy.ramm@utas.edu.au

19 **Mail:** School of Engineering and ICT, University of Tasmania, Private Bag 65, Hobart, Tasmania,

20 7001 (Australia)

21 **Phone (day):** +61 3 6226 7232

22

23 **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.

45

46 **Highlights**

- 47 • Diverse lived values—recreation, scenery and safety—are at risk of sea-level rise
- 48 • Only a subset of natural landscape units at risk are highly valued by residents
- 49 • Distinct groups of residents have unique sets of lived and landscape values
- 50 • Equitable adaptation policies require accommodating diverse lifestyles and values
- 51 • A combination of lived and landscape approaches can better inform adaptation policy

52

53 **Keywords**

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

55

56 **Acknowledgements**

57 The authors are grateful for the financial support of the Commonwealth of Australia through the
58 Bushfire and Natural Hazards Cooperative Research Centre program and the Australian
59 Government Research Training Program Scholarship. The authors also thank individuals that
60 participated in this research through survey and interviews.

61 **1 Introduction**

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

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

81 Early values-based studies on climate adaptation involved qualitative research into the social and
82 cultural values and activities that determine 'how' people interpret and respond to environmental
83 changes and adaptation policies (e.g. Kuruppu, 2009; Nielsen and Reenberg, 2010; Wolf et al.,
84 2013). Kuruppu (2009) found that religion potentially impedes climate adaptation in Kiribati
85 because it shapes the goals that individuals pursue. Nielsen and Reenberg (2010) identified that
86 cultural values of the *Fulbe* ethnic group of Burkina Faso prevent them from embracing particular
87 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 approach¹ was originally developed to associate perceived social values with landscapes

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.

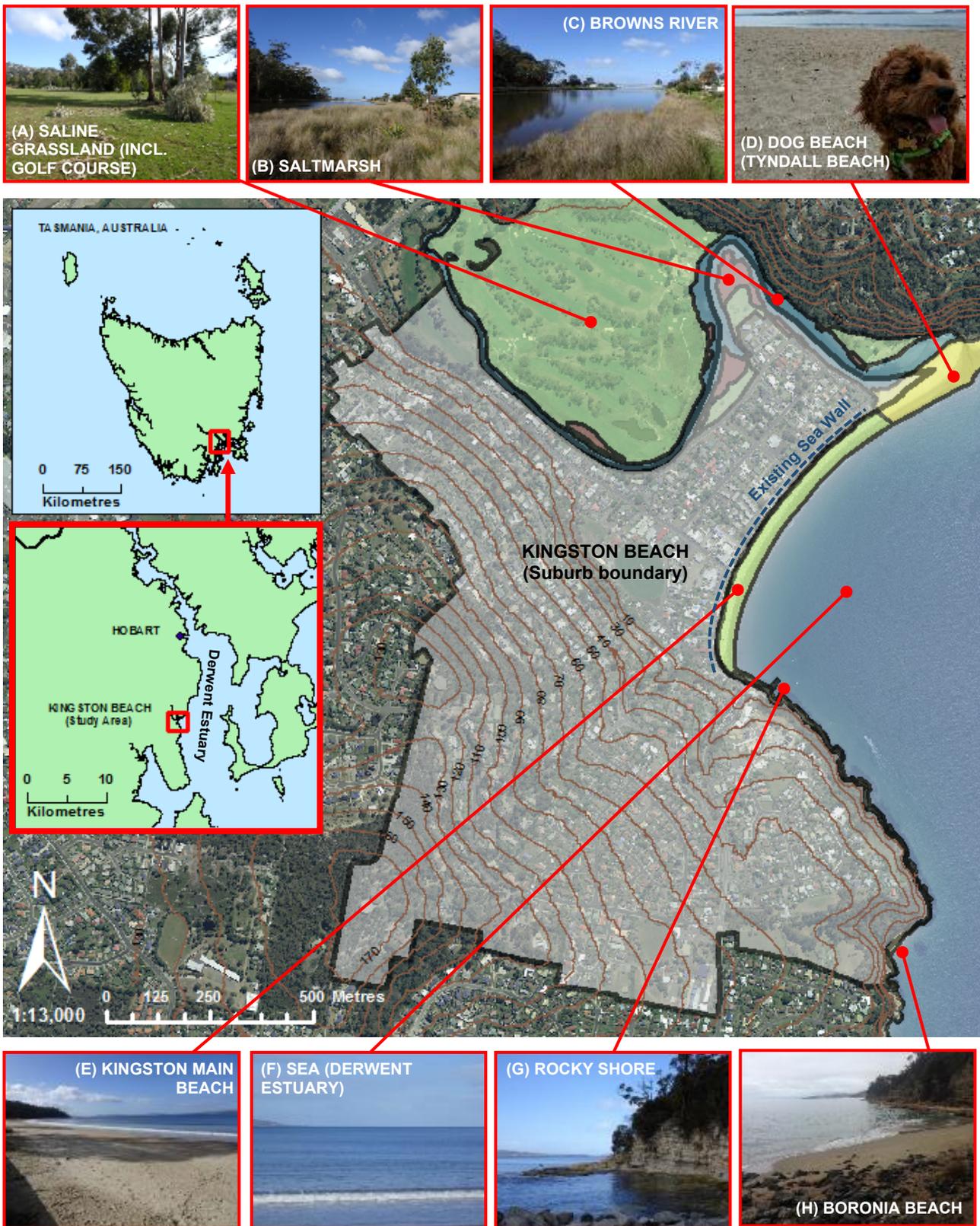
134 **2 Case study site: Kingston Beach**

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 century (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).



162

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

166 **3 Methods**

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

173 **3.1 Survey of the suburb**

174 **3.1.1 Survey design**

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

185 The landscape values mapping was guided by Brown (2006), Tyrvaïnen et al. (2007) and
186 Plieninger et al (2013). A shortlisted typology of nine social values was identified through semi-
187 structured interviews (Appendix B). An aerial map of the study area was provided with the survey
188 showing photographs of eight predefined coastal areas (landscape units). Respondents were
189 asked to rank up to three of the coastal landscapes in order of importance for each of the nine
190 values. This forced respondents to prioritise landscapes and allowed a weighted score to be
191 determined, reflecting overall community preference (rank 1 = 3 points; rank 2 = 2 points; rank 3 =
192 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).

202

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.

207

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 percent (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).

255

256

257

258

259

260

261

262

263

264

265 **Table 2.** Association of values with landscapes. Score refers to the number of times respondents
 266 ranked the landscape value as most important (rank = 1) along with the percentage of times the
 267 landscape was ranked most important overall. Standardised residuals greater than +2.0 (bold) and
 268 -2.0 (underline) reflect significantly greater or fewer observed frequencies respectively.

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

269
 270 Seven of the nine values were most frequently mapped to Kingston Main Beach and thus it had the
 271 highest overall weighted score (Table 3). This was followed by the sea and Browns River. Kingston
 272 Main Beach was the most frequent landscape unit used daily for recreational purposes (n=96),
 273 followed by the Dog Beach (n=48) and Browns River (n=29), supporting the strong access and
 274 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.

	Coastal landscape unit (Fig 1)							
Index name (see table footnotes)	A	B	C	D	E	F	G	H
	Saltmarsh	Grass / golf course	Browns River	Dog Beach	Kingston Beach	Sea / Derwent	Rocky shore	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> (4.2%)	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
 279

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.

286

287

288

289

290

291

292

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: Independen t 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

295

296

297
298**Table 5.** Variables that are statistically significantly different ($p < 0.05$) across the clusters. The clusters with the highest (bold) and lowest (underline) 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
<i>Demographics</i>	Age (over 65)	<u>2.1</u>	8.6	34.9	83.6	62.2	74
	Age (35-64)	58.3	62.1	37.2	<u>15.1</u>	31.1	24
	Age (18-34)	39.6	29.3	27.9	<u>1.4</u>	6.7	2
	Education (university qualification)	75	67.2	48.8	64	52.3	<u>42.9</u>
	Home ownership (owned outright)	52.1	<u>35.6</u>	51.2	91.9	82.2	77.6
	Household (one/two person)	<u>31.3</u>	43.1	71.4	95.9	97.8	94
	Income (less than \$1000/week)	18.8	<u>5.1</u>	23.3	45.9	40	40.8
<i>Lived values</i>	Recreational opportunities (very important)	54.2	40.4	44.2	32.4	35.6	<u>15.2</u>
	Safety (very important)	87.5	84.7	81.4	67.6	64.4	<u>50</u>
	Unique for children (very important)	59.6	47.4	48.8	24.7	33.3	<u>20</u>
	Flat landscape (very important)	<u>2.1</u>	18.6	20	28.6	22	20
<i>Activities</i>	Volunteer (daily or weekly)	16.7	6.8	16.7	39.2	18.2	<u>6.4</u>
	Go for a jog (daily or weekly)	20.8	27.6	23.3	1.3	<u>0</u>	4.2
	Go for a bike ride (daily or weekly)	14.6	27.1	14	9.3	<u>4.5</u>	14.6
	Go to the gym (daily or weekly)	18.8	29.3	16.3	17.1	9.1	<u>4.2</u>
	Visit to parks (daily or weekly)	43.8	28.8	23.3	16	20	<u>10.6</u>
	Access the beach (daily or weekly)	85.4	83.1	76.2	74.7	67.4	<u>60.4</u>
<i>Interactions and networks</i>	Family (daily or weekly)	93.8	83.1	86	71.6	<u>69</u>	72.9
	Friends (daily or weekly)	87.5	70.7	90.7	92	83.7	<u>59.6</u>
	Neighbours (daily or weekly)	34	<u>30.5</u>	51.2	54.7	45.2	36.7
	Community group members (daily or weekly)	48.9	36.2	55.8	79.2	56.8	<u>13.3</u>
<i>Landscape values</i>	Kingston Main Beach - recreation (most important)	48.9	73.2	57.1	45.2	71.4	<u>42.9</u>
	Kingston Main Beach - therapeutic (most important)	40.4	55.4	54.4	39.7	33.3	<u>26.5</u>
	Sea/Derwent - therapeutic (most important)	14.9	10.7	<u>7.1</u>	13.7	14.3	30.6
	Browns River - historic (most important)	27.7	16.1	<u>9.5</u>	31.9	24.4	14.3

299

300 **4.3.1 Cluster 1: Work-life balancing families**

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

308 **4.3.2 Cluster 2: Physically-active, full-time workers**

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

316 **4.3.3 Cluster 3: Team sport oriented residents**

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

324 **4.3.4 Cluster 4: Community-minded retirees**

325 Almost all members of this group are retired or semi-retired, highly active members of the
326 community. All members of the group belonged to at least two community organisations and they
327 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

353 **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.

364 **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 lesser
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.

406 **5.2 Advancing the lived and landscape values mapping approaches**

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

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

422 On the other hand, the lived values approach highlights missing values in the landscape values
423 mapping approach. One of the key lived values of Kingston Beach residents, as well as residents
424 in other Australian coastal communities, was feeling that it was a ‘safe place to live’ yet none of the
425 nine values included in the typology here, nor the longer list of sixteen landscape values covered in
426 other studies (Cole et al., 2015) consider safety as a social value. The other lived value that is
427 often missing from landscape values mapping approaches is ‘social interactions’. While lived
428 values pertaining to social interactions were not ranked highly by residents in Kingston Beach in
429 open or closed-questions, they were instrumental to understanding within-community differences in
430 Kingston Beach and Lakes Entrance (Graham et al., 2014). Membership in community groups as
431 well as interacting with family, friends and neighbours were defining features of clusters in both
432 studies. Although ‘social interactions and memories’ were identified as important by Strickland-
433 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
<i>Lived values</i>	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
<i>Activities</i>	Jogging opportunities	-4	-6	-5	-2	-1	-3
	Access the beach	-6	-5	-4	-3	-2	-1
<i>Landscape values</i>	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

507 **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, Kasperek 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-](http://dx.doi.org/10.5751/ES-07050-200104)
553 [07050-200104](http://dx.doi.org/10.5751/ES-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 Plieningen, 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., Alice, 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

596 **Vitae**

597 **Tim Ramm** is completing his PhD in Engineering at the University of Tasmania. His research
598 examines the development of coastal adaptation pathways in communities to manage changing
599 social and physical risk. Tim is a chartered professional engineer with Engineers Australia and
600 previously worked as a project manager on civil infrastructure projects in Melbourne, Australia.

601 **Dr Sonia Graham** is a Lecturer in social research and policy in the School of Social Sciences at
602 University of New South Wales. Her research seeks to understand the ways in which
603 environmental policies affect people, focusing on concepts such as collective action, trust, power,
604 fairness, legitimacy and values.

605 **Dr Chris White** is a Senior Lecturer in Environmental Engineering at the University of Tasmania.
606 His research spans the environmental, engineering and earth systems sciences, focusing primarily
607 on the climatic natural hazards of flooding, coastal inundation and heat extremes, from both the
608 physical processes and risk management perspectives.

609 **Dr Christopher Watson** is a Senior Lecturer in Geodesy and Spatial Sciences the School of Land
610 and Food at the University of Tasmania. His research is focused on understanding and quantifying
611 the response of sea-level to a warming climate using satellite based and in situ sensors.

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

618 **Place-based observations form**

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)		Wind (on site)			
<input type="checkbox"/> Sunny	<input type="checkbox"/> Partly cloudy	<input type="checkbox"/> Calm	<input type="checkbox"/> Light winds	<input type="checkbox"/> Moderate	<input type="checkbox"/> Gale
<input type="checkbox"/> Overcast	<input type="checkbox"/> Rainy	<input type="checkbox"/> Fresh winds	<input type="checkbox"/> Strong winds	<input type="checkbox"/> 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

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

622

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**

631

632

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**

645

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

652

653

654 Map of Kingston Beach area – observations and sketches



655

656

657

658

659 **Semi-structured interview questions**

660 **Introductory**

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

667

668 **Everyday life (lived values)**

669 The next two questions are designed to get an understanding of people's everyday lives. What
670 they do, who they interact with and the places they spend time. With that in mind:

- 671 2. Please describe the main activities you can recall undertaking yesterday/last Friday (if
672 interview is conducted Tuesday-Friday/Monday) including where each activity occurred,
673 with whom and the amount of time you spent performing each one. The order in which you
674 undertook these activities is not important.
675 a. *Contracted time*: What paid work or study did you engage in?
676 b. *Committed time*: What household tasks, shopping, food preparation or care
677 (children or others) did you engage in?
678 c. *Leisure*: What leisure and social activities did you engage in?
679

- 680 3. *Weekends*: Please describe the main activities you can recall undertaking last Saturday
681 including where each activity occurred, with whom and the amount of time you spent
682 performing each one. The order in which you undertook these activities is not important.
683 a. *Contracted time*: What paid work or study did you engage in?
684 b. *Committed time*: What household tasks, shopping, food preparation or care
685 (children or others) did you engage in?
686 c. *Leisure*: What leisure and social activities did you engage in?
687

688 **Place attachment (place-based values)**

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

- 690 4. In addition to (any) places you mentioned previously, are there any other places that you
691 spend time in in Kingston Beach?
692
- 693 5. Are any of the places you have mentioned in some way special to you?
694 a. For what reasons?

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

Values assigned to natural coastal areas

710 For the next set of questions, please think specifically about natural coastal areas:
711
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

Changing natural hazards

725
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
743
744
745
746
747

- 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

Wrap up

- 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.

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 outside Tasmania
- 798

800
801
802
803
804
805
806
807
808
809
810
811
812
813
814

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

5. What is most important to you about living in Kingston Beach?

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

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

815
816
817
818
819
820
821
822
823
824
825
826
827
828

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

829
830
831

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

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

832
833
834
835
836
837
838
839

SECTION 3: Thinking about how you spend your time

9. How often do you do each of the following activities in the suburb? (Place a tick in the appropriate box for each item listed)

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

840
841
842
843
844
845
846

847
848
849
850
851

SECTION 4: Thinking about how you value coastal areas

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

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

852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874

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

875

876

877

878

879

880

881

882

883

884

885

886

887

888

889

The page has been intentionally left blank

890 The map below shows coastal areas in Kingston Beach, identified with letters A through to H.
891 Please use this map for **questions 12 and 13**.
892



UNIVERSITY of TASMANIA



893
894
895
896
897

898 12. For each 'value' shown in the table below, please choose up to 3 coastal areas that are
 899 important to you because of that value. The coastal areas should be numbered in order
 900 of importance (i.e. 1 = most important, 2 = second, 3 = third). If the value is not important
 901 to you, leave that row empty.
 902

903 **EXAMPLE**

If you value the Sea most of all for 'access', then Kingston main Beach, then Browns River, 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	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> 3	<input type="checkbox"/>	<input checked="" type="checkbox"/> 2	<input checked="" type="checkbox"/> 1	<input type="checkbox"/>	<input type="checkbox"/>

(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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aesthetic: Enjoyable scenery, sights, sounds and smells	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Biodiversity: Variety and abundance of fish, birds, animals and plant life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Future: Future generations can experience healthy, productive, and sustainable ecosystems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Historic: Natural and human history that matters to individuals and communities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Identify/ symbolic: Sense of place, community and belonging	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recreation: Providing enjoyable outdoor recreation activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Therapeutic: Enhanced feelings of wellbeing (e.g. stress relief, comfort and calm)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Natural: Minimal human impact or intrusion on the natural environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

909
910
911
912
913
914

915
916
917

13. Referring again to the map, how often do you use the following areas for recreational 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	<input type="checkbox"/>				
B	Saline grassland (incl. golf course)	<input type="checkbox"/>				
C	Browns River	<input type="checkbox"/>				
D	Dog Beach	<input type="checkbox"/>				
E	Kingston Main Beach	<input type="checkbox"/>				
F	Sea (Derwent River)	<input type="checkbox"/>				
G	Rocky shore	<input type="checkbox"/>				
H	Boronia Beach	<input type="checkbox"/>				

918
919
920
921

SECTION 5: Thinking about flooding events

922
923

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

924
925
926
927
928

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

929

930
931

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

932
933
934

- Local government (Council) Individual residents
 State government I don't know
 Federal government (Commonwealth) Other: _____

935

936
937

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

938
939

- Yes
 No

940

941
942

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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The beach	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The value of my house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feeling safe in my house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Getting insurance for my house	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
My annual rate and insurance premium costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Emergency access via Beach Road	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The natural environment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

944

945 **18. Consider a hypothetical scenario where the beach was lost to sea level rise. Would you**
946 **consider moving to another suburb?** *(Please tick one)*
947 Yes
948 No
949 I don't know

950
951 **19. What are your council rates each year (estimated)?** If you rent, please estimate this
952 amount.
953 _____ *(dollars per year)*
954
955
956

957 **20. Council rates are spent on important services such as waste management and**
958 **infrastructure. If the risk of flooding from Browns River to your house or public**
959 **infrastructure increased, would you like to see money spent on activities to reduce flood**
960 **risk?** Currently about 3% of rates is currently spent on natural resource management across
961 the municipality. *(Please tick as many that apply)*
962 Yes – using a separate rate / extra rent
963 Yes – using a larger proportion of my existing rate → **(go to question 23)**
964 No → **(go to question 25)**
965
966

967 **21. If the risk of flooding from Browns River increased, what extra rate on top of your**
968 **existing rate would you consider paying to manage flood risk?** If you rent, please state an
969 additional rental amount.
970 _____ *(dollars per year)*
971
972
973

974 **22. If the beach was hypothetically lost to sea level rise, would you change your answer to**
975 **the above question (i.e. the amount you would pay to reduce flood risk)?**
976 No
977 Yes *(please specify the new amount):* _____ *(dollars per year)*
978
979 *If you would not want to use a larger proportion of your existing rate to manage flood risk (in*
980 *addition to a separate rate), go to question 25.*
981
982

983 **23. If the risk of flooding from Browns River increased, what percentage of your annual**
984 **rates would you like to see allocated to managing flood risk?** *Remember that this amount*
985 *will no longer be available for other services which would have to be cut.*
986 _____ *(% of annual rates)*
987
988

989 **24. If the beach was hypothetically lost to sea level rise, would you change your answer to**
990 **the above question (i.e. the allocation of rates to manage flood risk)?**
991 No
992 Yes *(please specify the new amount):* _____ *(% of annual rates)*
993
994
995
996
997
998

999
1000
1001
1002
1003

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	<input type="checkbox"/>				
Friends	<input type="checkbox"/>				
Neighbours (not counted as friends above)	<input type="checkbox"/>				
Work colleagues outside work	<input type="checkbox"/>				
Members of groups or organisations that you belong to	<input type="checkbox"/>				
Other members of the community	<input type="checkbox"/>				

1004
1005
1006
1007
1008
1009
1010
1011
1012
1013

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)	<input type="checkbox"/>	<input type="checkbox"/>
Religious or church organisations	<input type="checkbox"/>	<input type="checkbox"/>
Education organisations	<input type="checkbox"/>	<input type="checkbox"/>
Arts, music or cultural organisations	<input type="checkbox"/>	<input type="checkbox"/>
Youth organisations (e.g. Scouts)	<input type="checkbox"/>	<input type="checkbox"/>
Local community action groups	<input type="checkbox"/>	<input type="checkbox"/>
Conservation or environmental groups	<input type="checkbox"/>	<input type="checkbox"/>
Sports or recreation groups (e.g. sailing, dog walking)	<input type="checkbox"/>	<input type="checkbox"/>
Other <i>(please specify)</i> : _____		

1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027

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

- 1028 **30. What age group do you fall into? (Please tick one)**
1029 18-24 55-64
1030 25-34 65-74
1031 35-44 75-84
1032 45-54 85 and older
1033
1034 **31. How many people usually live in your house including you? _____ (people)**
1035
1036 **32. Is anyone in your house dependent on the care of someone else? (Please tick one)**
1037 Yes
1038 No
1039
1040 **33. Which of the following best describes your household? (Please tick one)**
1041 Single person household Extended family
1042 Single with child/children Share house
1043 Couple Other
1044 Couple with child/children
1045
1046 **34. Do you own at least one dog? (Please tick one)**
1047 Yes
1048 No
1049
1050 **35. What is your gross (before tax) weekly household income? (Please tick one)**
1051 Nil
1052 \$1 – \$399 per week (\$1 - \$20,749 annually)
1053 \$400 – \$999 per week (\$20,800- \$51,949 annually)
1054 \$1,000 – \$1,999 per week (\$52,000 - \$103,950 annually)
1055 \$2,000 or more per week (\$104,000 or more annually)
1056 Rather not say
1057 Don't know
1058
1059 **36. Is your home in Kingston Beach your main residence or second home (i.e. holiday**
1060 **house)? (Please tick one)**
1061 Main residence
1062 Second home or holiday house
1063
1064 **37. Which of the following best describes you? (Please tick one)**
1065 Renting my house
1066 Own my house without a mortgage → **(go to question 39)**
1067 Own my house with a mortgage
1068
1069 **38. Do you have greater than 30% of your gross weekly household income going to**
1070 **mortgage repayments or rent for your main residence? (Please tick one)**
1071 Yes
1072 No
1073 Rather not say
1074 I don't know
1075
1076
1077
1078
1079
1080
1081
1082

1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116

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
- Year 11, or equivalent
- TAFE or other vocational certificate
- Year 10 or below
- Year 12, TCE or equivalent
- 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

1117 **Appendix B – Definition of social values used in landscape mapping**

1118 A definition of the typology of nine values, in the survey, based upon Cole et al., (2015), are shown
1119 in Table B.1.

1120

1121 **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

1122

1123 Other landscape values from Cole et al. (2015) not included in the survey were:

- 1124 1. Cultural – passing down wisdom, knowledge and traditions
- 1125 2. Economic – tourism, fisheries and other business
- 1126 3. Intrinsic – place just exists
- 1127 4. Learning – educational value
- 1128 5. Life sustaining – produce, support and preserve human and natural life
- 1129 6. Spiritual / novel experience – sacred, religious, unique and/or profound experiences where
1130 respect for nature is felt
- 1131 7. Subsistence – provide basic human needs

1132

1133

1134 **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 (<i>proximity to city, shops and other valued places</i>) *	✓	✓	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 (<i>and quiet</i>) *	✓	✓	31 (9.6)
	A safe place to live (<i>feeling of</i>) *	✓	✓	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 (<i>and proximity</i>) / Easy access to the beach *	✓	✓	118 (36.6%)
	The scenery (and views) (<i>outlook</i>) *	✓	✓	83 (25.8%)
	Natural environment *	✓	✓	46 (14.3%)
	Friendly people / community feel *	✓	✓	37 (11.5%)
	Location (<i>close to water</i>) *	✓	✓	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 (<i>open spaces</i>)			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 (<i>beach lifestyle</i>) *	✓	✓	45 (14.0%)
	Ambience / atmosphere (<i>character</i>) *	✓	✓	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 (<i>great place to raise a family</i>) *	✓	✓	5 (1.6%)
	Away from the city		✓	3 (0.9%)
	Quality of life		✓	1 (0.3%)
			Total	45

