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3 **Understanding pathways to shifting people's values over time in the context of social-**  
4 **ecological systems**

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12 **Abstract** (250 words)

13 Despite rich theorisation on the structure and content of people's values and great interest in  
14 the concept of value change, there is currently little coordinated understanding of how  
15 people's values might shift over time. This paper draws upon different value traditions in a  
16 multi-level framework that articulates possible pathways of value change within individuals  
17 and groups and in a social-ecological context. Individual and group level values may change  
18 in response to events over an individual's life course or changes in social-ecological context  
19 that people are living in. Group-level values may also change as the composition of  
20 individuals within a social group change. These pathways are likely to act differently on  
21 values conceived as guiding principles (transcendental values) and values that people assign  
22 to people, places or things around them (contextual values). We present a research agenda  
23 needed to better understand these pathways: assessing the associations between value change  
24 and demographic change in a highly mobile world; developing a theoretical and empirical  
25 basis for understanding value shifts associated with social-ecological and land-use change;  
26 clearer identification of the groups of people that are subject to proposed mechanisms  
27 explaining value shifts; and bridging psychological framing of values to other more embodied

- 28 understandings that may be better placed to explain value shift in the context of social-
- 29 ecological change.

## 30 **Introduction**

31 Shifting people's values has been identified as a critical step on the road to sustainability and  
32 halting biodiversity loss (Ives and Fischer 2017a). Calls are being made for a new research  
33 agenda to better understand the dynamics of people's values in response to social-ecological  
34 change (Manfredo et al. 2017). However, the social psychology tradition suggests that  
35 people's values are difficult to shift; values are seen as fairly stable within individuals, or  
36 adapting slowly to changing circumstances over time (Gouveia et al. 2015; Milfont et al.  
37 2016; Vecchione et al. 2016). While it has been proposed that changes in values may occur  
38 slowly in response to large changes in social-ecological context (Manfredo et al. 2017a), the  
39 mechanisms that underpin this remain unclear. Societies around the world are facing  
40 unprecedented rapid social-ecological change, and better understanding of how different  
41 kinds of values may be shifting in light of this could provide important insights for  
42 sustainability globally.

43 A small but growing body of empirical evidence supports thinking about the dynamics of  
44 values over time. Research in social psychology has demonstrated that an individual's value  
45 priorities can change over the life-course in response to individual and societal changes  
46 (Bardi et al. 2009). Some evidence suggests that there are both automatic (involuntary  
47 responses to external events) and effortful (intentionally selected) routes to value shift (Bardi  
48 and Goodwin 2011). Manfredo and others have argued that values at the group level are in  
49 part the outcome of people's adaptation to the social-ecological system they are living in, and  
50 thus as people's needs in relation to the environment change so can their values (Manfredo et  
51 al. 2017). Deliberation and social learning have been shown to lead to short-term shifts in  
52 people's values (Kenter et al. 2015; Raymond and Kenter 2016). At a societal/cultural level,  
53 'economic development' (as measured by per capita GDP) has led to observable shifts

54 towards rational and self-expression values (Inglehart and Baker 2000) and autonomy and  
55 egalitarianism (Schwartz 2006). At generational time scales, shifts in society's values for  
56 forests have been observed away from utilitarian towards multifunctional values (Bengston et  
57 al. 2004) demanding engagement with more complex understandings of sense of place and  
58 place meaning by forest managers (Williams and Stewart 1998). Cross-sectional studies have  
59 also highlighted that demographic factors can shape group-level values (Manfredo et al.  
60 2009, 2016). Collectively, these studies suggest that values can change individually and at the  
61 group level through a variety of mechanisms, but that this change is likely to be slow and  
62 over long periods of time.

63 Human-engineered shifts in values can be seen as untenable (Manfredo et al., 2016) and  
64 invite ethical questions about the normative positions driving this intention. However, driving  
65 value change remains an important consideration for many advocates and practitioners in  
66 sustainability science (Ives and Fischer 2017b). A better understanding of the relative  
67 importance of mechanisms that underpin changes in people's values may unlock the  
68 possibility of managing this process. To achieve this, greater theoretical and conceptual  
69 clarity is required to better understand how different factors could influence shifts in values  
70 within a sustainability context.

71 In this paper, we bring together literature from psychology, human geography and cultural  
72 studies to develop a conceptual framework for understanding possible pathways by which  
73 people's values could shift over time. We then identify avenues for future research needed to  
74 develop a more holistic understanding of how these shifts in people's may occur, and to  
75 understand the relative importance of these different pathways in the context of changing  
76 social-ecological systems.

77 ***Conceptual background***

78 We conceptualise values broadly, drawing on a variety of disciplinary perspectives. In social  
79 psychology, transcendental values (also known as held or core values) are seen as abstract  
80 ideals or beliefs about desirable end states or behaviours that transcend specific situations  
81 (Schwartz and Bilsky 1987). Schwartz (1992, 1994) identified a universal and relatively  
82 stable set of values grouped into two bipolar dimensions of conflicting values: self-  
83 transcendence values (universalism and benevolence) versus self-enhancement values (power  
84 and achievement), and conservation values (security, conformity and tradition) versus  
85 openness to change values (self-direction, stimulation and hedonism). These are considered  
86 bipolar as only one dimension is active in any particular context e.g. self-transcendence or  
87 self-enhancement, but not both.

88 A simplified subset of Schwartz's (1992, 1994) values is often used in studies related to the  
89 environment, applied in a three-dimensional structure of biospheric, altruistic (drawn from  
90 the self-transcendent group) and egoistic values (drawn from the self-enhancement group).  
91 Each dimension represents a predisposition to evaluate the world the world for impacts on the  
92 environment and the biosphere (biospheric: e.g., protecting the environment, preventing  
93 pollution), the welfare of others (altruistic: e.g., equality, being helpful), and benefits for the  
94 self and immediate others (egoistic e.g., social status, wealth) (Stern et al. 1995; de Groot and  
95 Steg 2007). These abstract, transcendental values have some capacity to predict pro-  
96 environmental behaviours (Stern 2000) and environmentally relevant attitudes such as the  
97 acceptability of forestry management alternatives (Ford et al. 2009a). Recent work has  
98 explored the role of hedonic (pleasurable wellbeing) and eudaimonic (virtuous wellbeing)  
99 values in the accrual of benefits of connection to and contact with nature, and as drivers of  
100 pro-environmental behaviours (Winkler-Schor et al. in press; Steg et al. 2014)

101 These abstract, universal values are contrasted with contextual values (also known as  
102 assigned values), where people's values (and other considerations) are applied to a particular  
103 context, through a valuation process, to determine the value (or values) of contextual entities  
104 to an individual. Contextual values are influenced to some extent by transcendental values  
105 (Kenter et al. 2015; Kendal et al. 2015). For example, the Valued Attributes of Landscape  
106 Scale (VALS) asks participants to value different attributes of valued landscape context, and  
107 then determines the underlying structure of these attribute values to determine plural values  
108 for landscape (Kendal et al. 2015).

109 Transcendental and contextual values can also be described at the group level. This can be  
110 achieved by aggregating the response of individuals to generate group-level values e.g.  
111 (Schwartz 2006; Raymond et al. 2014). This approach is commonly used in cross-sectional  
112 studies to explore how values vary across cultural groups (Inglehart and Baker 2000;  
113 Schwartz 2006), or across political boundaries (Manfredo et al. 2009). Group level values  
114 may also be measured by specifically eliciting values that may be shared at a group level e.g.  
115 societal, institutional and cultural values (Kenter et al. 2015).

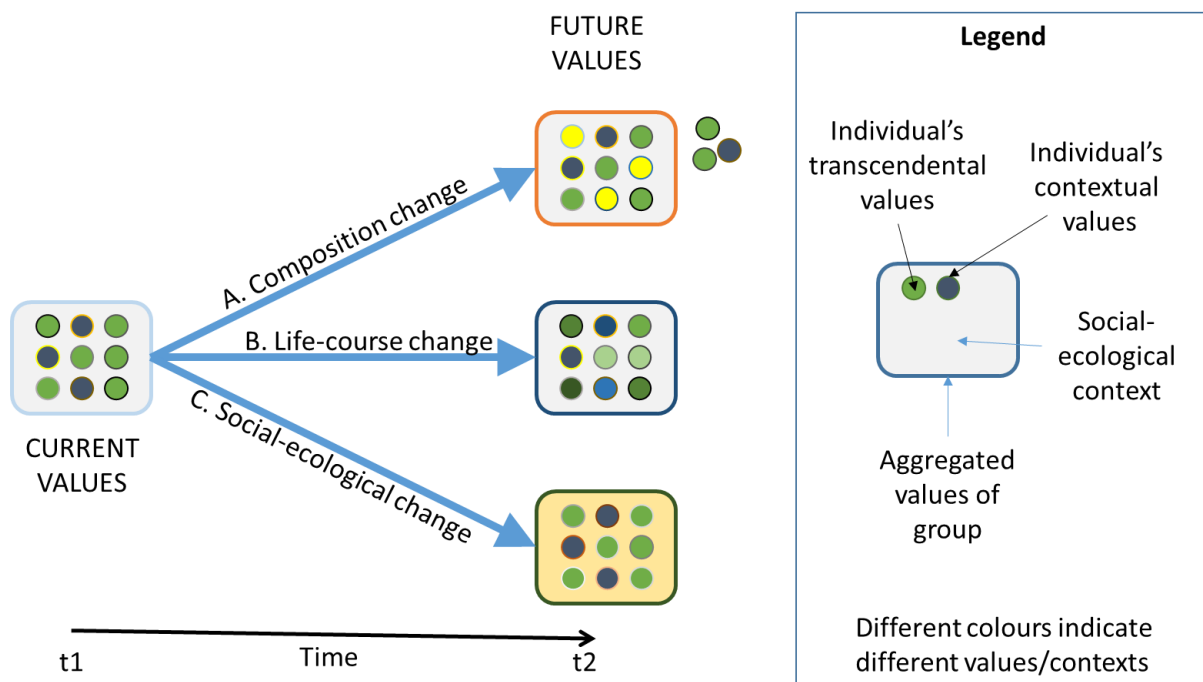
116 A distinct tradition of social values draws on philosophy to distinguish between intrinsic  
117 values (things that are important of themselves) and instrumental values (things that are  
118 important to achieve some other end). Economic approaches to values have tended to focus  
119 on instrumental values (things that are important to achieve human wellbeing) and distinguish  
120 between use (the importance of the use of something) and non-use value (importance of  
121 something without reference to use, such as importance to preserve for future generations)  
122 (Turner et al. 2003). Recent approaches further distinguish relational values from  
123 instrumental and intrinsic values, where the value of contextual entities to the group or to  
124 other individuals are considered in the valuation process (Chan et al. 2016).

125

126 **A framework for understanding change in people's values**

127 A number of possible pathways exist through which people's values may change, for  
128 different kinds of values at both individual and group levels (Fig 1). First, while an  
129 individual's transcendental values may be relatively stable over time, immigration and  
130 emigration from the group over time may result in changes in the composition of  
131 transcendental values of individuals in the group (path A). Second, individuals change over  
132 time in ways that can result in shifts in their transcendental values (path B). Both changes in  
133 group composition dynamics and individual change over the life course could in turn  
134 influence aggregated transcendental values, and influence of other kinds of values related to  
135 the expression of individual transcendental values (e.g. contextual values) or related to the  
136 values of other people in the group (e.g. relational values, shared group values). Third, the  
137 social-ecological system that individuals and groups are living in may change through  
138 environmental shocks (e.g. natural disasters) and stresses (e.g. increased temperatures caused  
139 by global climate change), and social-cultural changes as a result of economic development,  
140 migration and urbanisation (path C). This most obviously and directly could result in shifts in  
141 contextual values, as the entities in the world being valued change, although it has been  
142 argued that both environmental conditions (Fischer and Boer 2016; Manfreda et al. 2016) and  
143 economic development (Inglehart and Baker 2000) are important factors shaping  
144 transcendental values.

145



146

147 Fig.1 – A framework for conceptualising how people’s values might change in time (t1 ->  
 148 t2). This shows how transcendental and contextual values may change over time at both the  
 149 individual and group levels through a) immigration and emigration of individuals from the  
 150 group; b) change in individual’s values over the life course; and c) social-ecological change.

151 ***A. Changes in composition of individuals within a group***

152 Changes to the composition of individuals within a group can lead to shifts in people’s values  
 153 in several ways. First, the values of individuals are often aggregated to represent the values of  
 154 a social group; as individuals change, the aggregated transcendental and contextual values of  
 155 the group can change too (Schwartz 2006; Raymond et al. 2014). Second, the values of  
 156 people within a group can be determined in part by other members of the group, such as in  
 157 shared group values (Kenter et al. 2015), contextual values expressed on behalf of a group  
 158 e.g. “maintaining an area as wilderness is of unmeasurable value to society” (Brown, 1984,  
 159 p235) and relational framings of value (Chan et al. 2016).

160 *Aggregating individual values to the group level*



161 Individual values can be aggregated in different ways across social groups and communities.  
162 In the sustainability sciences, individual values are often aggregated to represent a broader  
163 ‘community’ through the mapping of landscape values (Brown and Fagerholm 2014; Garcia-  
164 Martin et al. 2017) or calculating the mean of individual responses to questions about  
165 transcendental values to inform ecosystem management (Wallace et al. 2016). Processes such  
166 as auctions and elections can be used to determine group-level contextual values (Brown,  
167 1984).

168 Across time, a number of processes can lead to changes in the composition of individuals  
169 within the group of interest. Immigration to and emigration from the group can lead to  
170 differences in aggregated values where the values of immigrants differ from the values of  
171 emigrants (Manfredo et al. 2009), particularly where the values of people leaving and  
172 entering the group are consistently different. Similarly, births (and subsequent value  
173 formation through childhood and early adulthood) and deaths can similarly lead to change in  
174 aggregated values when the new members of the group have values that are different from  
175 those leaving the group. These processes could lead to pronounced changes in people’s  
176 values when a high proportion of individuals within the group change. This has been  
177 demonstrated for ‘tree changers’ where lifestyle landholders with stronger conservation  
178 values are replacing traditional agricultural farmers in rural Australia (Mendham et al. 2012) ,  
179 and in urban areas where residents become displaced or excluded in areas of re-greening due  
180 to rising property values (Quastel 2009).

### 181 *How individuals within a group may influence each other’s values*

182 Changes in group composition may also directly influence the values of other members of the  
183 group. People influence each others values through processes of value socialisation and  
184 internalisation (van Riper et al, 2018). Studies on the parent-child relationship suggest that

185 socialization is an ongoing process of parents attempting to pass on their values to children.  
186 Greater parent monitoring and strictness have been associated with more parent-adolescent  
187 agreement (Pratt et al. 2003), although variations in these relationships have been identified  
188 within sub-groups (Knafo and Schwartz 2001) and across cultures (Tulviste et al. 2012).  
189 Value socialization not only involves relationships between parents and children, but also  
190 transactions with the surrounding culture and with the parents' own changing ideas about  
191 what to pass on to their children (see e.g. Kuczynski et al. 1997). Children and adolescents  
192 can challenge and sometimes resist the values of adults that they consider to be inappropriate,  
193 immoral, or illegitimate, or otherwise not in line with the group (Smetana et al. 2014). Values  
194 can also change in response to signals about socially prescribed roles in adulthood, as  
195 evidenced by increases in security, conformity, and tradition values into adulthood  
196 (Vecchione et al. 2016).

197 At a cultural level, values are ingrained in norms, attitudes and behaviours that exist within  
198 and between collectives (van Riper et al., in press). In the environmental values literature,  
199 recent research points to bi-directional relationships between both individual and cultural  
200 values on the one hand and collective action on the other hand (van Riper et al, in review).  
201 Cultural values influence an individual's transcendental values through socialization,  
202 internalisation or by participation in collective action. Individual values can become cultural  
203 values when they are accepted as a set of norms and values by the group over a long period of  
204 time (van Riper et al, this feature).

205 Deliberation and engagement in social learning processes are two key mechanisms that can  
206 catalyse otherwise transitory changes to people's values (Kenter et al. 2016). A typology of  
207 transformative learning distinguishes learning about the consequences of actions, from  
208 reflecting on the assumptions which underpin actions, and from learning that challenges these

209 assumptions (Reed et al. 2010). Changing group composition is likely to influence how  
210 cultural, socialisation and bi-directional processes shape group values and shared values in  
211 different collective decision-making contexts. Group composition influences how values  
212 converge during deliberative processes (Newig and Fritsch 2009), and group diversity  
213 influences the rate of social learning that occurs (Wright and Rowe 2011; Cuppen 2012).  
214 However, it is less clear how cultural, socialisation and bi-directional processes affect value  
215 formation and change within the individual or group within such contexts.

### 216 ***B. Socio-psychological processes within the individual***

217 Social and environmental psychologists have studied the factors driving shifts in  
218 transcendental values within *individuals* across time. Value change theory suggests that there  
219 are two systematic, internal, sources of change in values within the individual: physical aging  
220 and major life events during the life course (Bardi and Goodwin 2011; Fischer et al. 2011;  
221 Gouveia et al. 2015; Milfont et al. 2016; Vecchione et al. 2016). Across all domains, most  
222 studies show that observed changes in values are not random but rather follow predicted  
223 patterns according to people's value systems (Lehmann and Payne 1963; Milfont et al. 2016).

#### 224 *Shifts in transcendental values in response to age*

225 Individuals' value priorities vary with age (see Milfont et al. 2016 for an overview). In cross-  
226 sectional studies, age has been correlated positively with conservation and self-transcendence  
227 values and negatively with openness to change and self-enhancement values (Schwartz 2005;  
228 Robinson 2013). Longitudinal studies have demonstrated that values change slowly  
229 throughout life as a reflection of biological and psychological maturation. Milfont et al.  
230 (2016) found that older adults and women placed greater emphasis on values relating to the  
231 welfare of others and preservation of traditional practices and stability (Self-Transcendence  
232 and Conservation values). Younger individuals and men tended to more highly value the

233 pursuit of status and power, and independent thought and behaviour (Self-Enhancement and  
234 Openness to Change). Value change can also exhibit non-linear patterns, suggesting that  
235 values can have different functions for different development stages. Conservation-related  
236 values have been shown to follow a U-shape pattern of change with across ages, with an  
237 initial decline during adolescence followed by a steady increase into adulthood (Gouveia et  
238 al. 2015).

239 Age differences in values can be explained by multiple factors. These include loss of  
240 strength and cognitive speed over the life; for example, promoting a shift from stimulation  
241 values earlier in life to conformity and tradition values later in life (Milfont et al. 2016). It  
242 also can relate to changing opportunity and demands across life stages. Milfont et al. point  
243 out that stimulation values should be less important in middle adulthood than security and  
244 conformity as a result of work and family responsibilities.

245

246

#### 247 *Shifts in transcendental values response to major life events during the life course*

248 Research suggests that major life events might affect intra-individual value change more so  
249 than age (Bardi et al. 2009; Milfont et al. 2016). Values can be challenged by major life  
250 transition such as unemployment (Bardi and Goodwin 2011), migration (Lönnqvist et al.  
251 2011; Goodwin et al. 2012; Bardi et al. 2014), vocational training and education (Bardi et al.  
252 2014) and transitions to adulthood (Vecchione et al. 2016). Values can also change in  
253 response to changing roles associated with life stages, such as marriage, widowhood, and  
254 child rearing (Kuczynski et al. 1997; Bardi and Goodwin 2011). The reasons for such value  
255 changes are mixed; for example, they can relate to the fulfilment of different hierarchies of  
256 needs, as in the case of new migrants where heightened levels of security values have been

257 identified post-migration (Lönqvist et al., 2011), or increased value socialization, resulting  
258 from involvement in various training and education programs (Bardi et al. 2014).

259 Across time these changes are likely to affect aggregated transcendental values, particularly  
260 where there are consistent changes within a group, such as rising education levels. These  
261 changes are also likely to change other kinds of values such as contextual and relational  
262 values where they are influenced by transcendental values.

263

### 264 ***C. Social-ecological context***

#### 265 *Shifts in transcendental values in response to societal development*

266 Values can shift in response to broader societal changes (Bardi and Goodwin 2011; Fischer et  
267 al. 2011; Gouveia et al. 2015; Milfont et al. 2016; Vecchione et al. 2016). Longitudinal  
268 studies have shown how processes of modernization (e.g., industrialization, occupational  
269 specialization, and centralization) have resulted in a shift toward materialistic values  
270 Inglehart (1997). The widely used New Environmental Paradigm scale (Dunlap & van Liere,  
271 1978) that measures environmental worldviews is premised on the idea that the  
272 dominant social paradigm had become outmoded by increasing awareness of the ecological  
273 degradation caused by traditional approaches to progress and growth. Post-industrialisation  
274 has since fostered a shift to humanitarian values, such as belongingness, and aesthetic or  
275 quality of- life concerns (Abramson and Inglehart 1995), and more mutualistic wildlife values  
276 (Manfredo et al. 2009). Consistent with this theory, values have been demonstrated to shift  
277 with socioeconomic development, toward values emphasizing empowerment, intellectual  
278 autonomy, egalitarianism, and greater appreciation of natural and social environments  
279 (Welzel et al. 2003; Schwartz 2006; Welzel 2014).

280 It has been theorised that social values can change slowly in response to changing historical,  
281 ecological, economic, institutional, and cultural events and circumstances (Inglehart and  
282 Baker 2000; Schwartz et al. 2000). Unfavourable life events lead individuals to become more  
283 materialistic and to emphasise security, whereas increasing prosperity and favourable life  
284 conditions promote self-expression (e.g., Maslow 1943; Inglehart and Baker 2000). For  
285 example, the importance of security, tradition, benevolence, and, to a lesser extent,  
286 conformity values increased after the Global Financial Crisis (Sortheix et al. 2017).

### 287 *Shifts in contextual values relation to ecological change*

288 In the traditional understanding of transcendental and contextual values, the role of social-  
289 ecological context is clear – relatively stable transcendental values are applied differently in  
290 different contexts. Thus, as the environment changes, environmentally relevant contextual  
291 values are also likely to change. Relatively small scale, longitudinal studies of landscape  
292 values (contextual values that are spatially distributed across a landscape) have shown  
293 relatively little change in the composition and distribution of these contextual values over  
294 time in both Kangaroo Island, Australia (2004-2010) and Alaska, USA (1998-2012) (Brown  
295 and Weber 2012; Brown and Donovan 2014). However, the same studies demonstrate large  
296 differences in the distribution of landscape values across land-uses, and suggested that “land-  
297 use changes such as those resulting from human development will significantly influence the  
298 distribution of landscape values” (Brown and Weber 2012, p316). The idea that ecological  
299 variation in space and time is directly related to value is often built into ecosystem service  
300 valuations, where ecological properties are used to predict the value of ecological systems.  
301 River hydro-geomorphological characteristics have been linked to differing values of  
302 rehabilitation projects (Thorp et al. 2010). At a larger scale, land-use change has resulted in a

303 loss of global ecosystem services estimated to be worth US\$4.3-20.2 trillion/year between  
304 1997 and 2011 (Costanza et al. 2014).

305 *Shifts in transcendental values relation to ecological change*

306 Transcendental values are generally thought to be fairly stable in response to environmental  
307 change. Cross-sectional studies have largely focussed on cultural determinants of differences  
308 in values (e.g. Schwartz 2006) rather than environmental determinants (not unsurprisingly  
309 given hostility towards environmental determinism). However, recent work suggests that  
310 ecological context can structure value expression; in places where ecological stress or threats  
311 are low, there tends to be less alignment between values and both attitudes and behaviours  
312 (Fischer and Boer 2016).

313 Perhaps surprisingly, transcendental values have not been a fundamental component of most  
314 social ecological systems frameworks, although contextual values such as the economic value  
315 of resources are a feature of many of these frameworks (Ostrom 2009; Binder et al. 2013).  
316 Incorporating transcendental values could benefit these frameworks by better understanding  
317 the plural motivations of actors within the system. A social-ecological systems approach has  
318 been used to explore how transcendental values may shift in response to environmental  
319 change (Manfredo et al. 2017). In this framing, humans are seen as part of the system and  
320 their transcendental values are formed in response to both social and environmental  
321 surroundings. For example, it has been argued that the American frontier environment led to  
322 cultural values of independence, that in turn were transmitted to the rest of the country  
323 (Kitayama et al. 2010). Manfredo et al. (2017) argue that value shift in response to social-  
324 ecological change is likely to be slow, and continues to reflect pre-existing differences in  
325 values between social-ecological systems. While value shift in response to societal change  
326 has been demonstrated in longitudinal and cross-sectional studies, the same level of evidence

327 is not yet available to demonstrate shifts in environmentally relevant transcendental values in  
328 response to ecological change.

329

### 330 **A research agenda for understanding and assessing shifts in people's values**

331 Perhaps surprisingly, there has been limited comparative exploration of the importance of  
332 different drivers in shifting different kinds of values. In the framework presented here, the  
333 psycho-social processes that underpin shifts in individual transcendental values over the life  
334 course are most well understood. Great research challenges and opportunities remain to better  
335 understand the role of drivers such as demographic and social-ecological change on  
336 individual, cultural and institutional values. A better understanding of these drivers is  
337 particularly important in a sustainability context, where some practitioners (e.g. Common  
338 Cause) have a mission to change people's values (Manfredo et al. 2017; Ives and Fischer  
339 2017a), and there is growing recognition that we have entered an age of global rapid social-  
340 ecological change that is likely to have some effect on people's values. We identify four key  
341 research opportunities to develop this understanding.

#### 342 *Assessing the associations between changes in people's values and demographic change in a* 343 *highly mobile world*

344 People are more mobile than they have ever been. Globally, there have been dramatic shifts  
345 e.g. away from rural areas to cities (UN Habitat 2013). The dismantling of racist immigration  
346 programs e.g. the White Australia Policy and civil rights movements have led to  
347 desegregation and the rapid rise of increasingly multicultural cities and regions in many  
348 places around the world (Mann 2012). Rising numbers of refugees have led to even more  
349 dramatic cultural mixing, as people are displaced and seeking refuge wherever it can be



350 found. Such trends result in new intercultural dynamics based on everyday negotiations of  
351 space and place between cultures (Radford 2016). Within countries, phenomena such as tree-  
352 change, gentrification and fly-in, fly-out work are dramatically changing the cultural and  
353 demographic composition of particular places (Mendham et al. 2012; Carson and Carson  
354 2014; Halasz 2018).

355 It is likely that this unprecedented mobility is leading to shifts in transcendental and  
356 contextual values in individuals and at the group level. Yet there is an absence of theory and  
357 empirical evidence to support policy and planning in this space. While transcendental value  
358 shift may be slow, the rapid rise in mobility may be leading to observable shifts in  
359 transcendental values, both in individuals, in other members of social groups and in  
360 aggregated measures. This landscape of highly mobile individuals provides a rich resource  
361 for future research on the effects of mobility on the transcendental values of people who are  
362 moving, on the communities they are moving into, and the communities they are leaving  
363 behind.

364 *Examining shifts in people's values associated with social-ecological and land use change*

365 In addition to increasing mobility, the world is undergoing rapid changes in intertwined  
366 social-ecological systems (McPhearson et al. 2016). Global environmental change is leading  
367 to regime shift in ecological systems (Hughes et al. 2013). Climate change and urban heat are  
368 changing the composition and distribution of everyday nature such as urban trees (Kendal et  
369 al. 2018). New patterns of agricultural production and urban expansion are leading to  
370 dramatic land use change in many places (Hegazy and Kaloop 2015; Bryan et al. 2016). The  
371 rapid rise of digital technologies and virtual ecologies (how the natural, built, sociocultural  
372 and virtual features of environments are interconnected and influence each other as part of a  
373 multi-faceted system) are leading to rapid changes to physical environments (Stokols 2018).

374 Theory predicts slow (multi-generational) shifts in transcendental values based on social-  
375 ecological change (Manfredo et al. 2017), yet increasingly rapid change affecting  
376 environmental risk and security thought to be important in shaping people's values (Fischer  
377 and Boer 2016) could potentially lead to rapid shifts in these values. While cross-sectional  
378 studies demonstrate significant differences in contextual values across land-uses, the  
379 dynamics of value change in response to ecological change (and associated changes to virtual  
380 ecologies) is poorly understood. Future research could assess the relationships and pathways  
381 linking environmental and value change using longitudinal methods. A fertile area of enquiry  
382 is to examine how transcendental values may change in response to different forms of  
383 ecological change.

384 It is also likely that changes in peoples' values are mediated by their beliefs about the  
385 consequences of social-ecological change (*sensu* Stern et al. 1999). If people believe that  
386 there will be adverse consequences on things that are important to them, it is more likely that  
387 they will undertake behaviours that address these consequences. These adverse consequences  
388 are more likely to be believed where they are consistent with people's values. Conversely,  
389 people may not accept information that social-ecological change is occurring where this is  
390 inconsistent with their values (Straka et al. 2016). Similarly, beliefs about the effects of  
391 social-ecological change on others is likely to be shaped by values, and therefore beliefs are  
392 also likely to affect values shared with or influenced by others, such as relational values or  
393 values elicited through deliberative processes.

#### 394 *Bridging differing understandings of values*

395 While this paper largely adopts a social psychological framing of values, alternative  
396 perspectives are acknowledged and may contribute to a better understanding of value shift,  
397 particularly in the context of changing social-ecological systems. Critics of psychological

398 approaches argue that psychological conceptualisation of values are disconnected from  
399 drivers of sustainability outcomes such as human behaviour – the ‘value-action gap’ (Shove  
400 2010). Disciplines such as sociology, anthropology and human geography instead  
401 conceptualise values to be, at least in part, socially constituted and therefore an expression of  
402 group ideals rather than just individual guiding principles (Demski et al. 2015). Rather than  
403 dichotomous – either transcendental or contextual – values are instead both embodied within  
404 a particular context and produced through interactions in the world (Raymond et al. 2018).  
405 From this perspective, values are neither completely abstract nor contextual, rather seen as  
406 ‘salient cultural resources ... ideals that require people to engage pragmatically with material  
407 and social arrangements that are not consistent with them’ (Demski et al. 2015, p60). These  
408 more embodied framings of values could be particularly useful in better understanding value  
409 shift in response to social-ecological change, as values are necessarily constructed through  
410 practices performed within the system i.e. values do not only influence behaviours, but  
411 behaviours can also influence values. They would also seem to be particularly useful in a  
412 sustainability context that is interested both in what is important to people, and the way they  
413 live in the world.

414

#### 415 *Pursuing more meaningful understandings of ‘community’*

416 Of course, the careful definition and sampling of the population of interest is critical to  
417 determining aggregated group-level values. Too often in values research, the population of  
418 interest is defined by convenience rather than in a manner that is closely connected to the  
419 values we are trying to measure: the general public, visitors, stakeholders or local people. A  
420 useful approach to identifying a meaningful sample frame distinguishes between *communities*  
421 *of place, interest, practice, and identity* (Harrington et al. 2008; Seymour et al. 2011).

422 *Communities of place* group people by geographic location, defined by a set of social,  
423 political and/or natural boundaries (Cheng et al. 2003; Harrington et al. 2008) (e.g. rural and  
424 urban landholders (Ives and Kendal 2013)). However, geography can be a poor predictor of  
425 values. *Communities of interest*, include people with shared interests or concerns that may not  
426 be spatially defined, and *communities of practice* share an activity such as conservation  
427 management, or farming (Seymour et al. 2011), may be more useful frames for understanding  
428 variation in values (Ford et al. 2009b). *Communities of identity* include people who share a  
429 common identity such as cultural background, class, age, gender, social networks, politics or  
430 practices that are spatially diffuse. This may be even more important with the rise of largely  
431 aspatial social media networks. Particular communities of identity such as the  
432 socioeconomically disadvantaged and youth are often underrepresented in studies of values  
433 and better representation of these communities could have important sustainability outcomes  
434 (Haase et al. 2017).

## 435 **Conclusion**

436 Here we have presented a conceptual framework that identifies three pathways that can lead  
437 to value shift in both transcendental and contextual values related to the environment. First,  
438 changes in the composition of individuals within groups can lead to changes in aggregated  
439 values of the group, and may influence the values of other members of the group such as  
440 shared social values, cultural values and relational values. Second, changes in individuals  
441 over the life course such as parenthood and maturation are known to change those  
442 individual's transcendental values. This in turn is likely to change people's contextual values  
443 in response to the world around them and the values of others. Third, changes in the social-  
444 ecological context are also known to influence transcendental values over time, demonstrated  
445 by post-industrial economic development leading to observed shifts in humanitarian and  
446 mutualistic values; yet the relationship between environmental change and both

447 transcendental and contextual value shift is poorly defined, and demands further empirical  
448 exploration.

449 This is fertile terrain for future theoretical and empirical study. Increasing mobility, rapid  
450 social-ecological change and the rise of virtual ecologies provides opportunities to study and  
451 test proposed mechanisms to explain value shift. However, group definition is critical to the  
452 accurate and meaningful representation of group values; future studies could more carefully  
453 define sampling frames, such as focus on communities of practice and identity that are more  
454 closely related to proposed mechanisms explaining value shift. Lastly, bridging psychological  
455 understandings of values with different framing of values that are better linked to the social-  
456 ecological context they are produced in, such as the more embodied understanding of values  
457 in human geography and sociology, could help to develop testable theory for changing social-  
458 ecological systems (acknowledging that some disciplinary divides will not be amenable to  
459 bridges).

460 Understanding pathways leading to shifts in values is needed to help policy makers  
461 meaningfully incorporate values into public policy (sensu Denhardt and Denhardt 2000) in a  
462 changing social-ecological system. And perhaps, understanding the mechanisms  
463 underpinning value shift can help those who believe that shifting people's values is a  
464 necessary step to creating a more sustainable future (Ives and Fischer 2017a).

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