

## **Using a resilience thinking approach to improve coastal governance responses to complexity and uncertainty: a Tasmanian case study, Australia**

### ***Abstract:***

Conventional approaches to environmental governance and management are limited in their responses to uncertainty and complexity of social-ecological system (SES) change. Prevailing neoliberal and efficiency-based mindsets tend to focus on avoiding risk and creating “fail-safe” systems. In the last decade, resilience thinking has emerged as a means to transition from risk-averse, and command-and-control governance approaches towards those that are more adaptive, innovative and collaborative. To examine the practical usefulness of a resilience thinking approach, we used a complex, multi-layered case study of Tasmanian coastal governance. Drawing on the diverse expertise and a variety of key governance actors, we identified crucial problems being experienced with the Tasmanian coastal governance regime and discussed potential contributions of resilience thinking to address them. Thematic analysis of the results revealed three major contributions: resilience thinking (1) provides a way to think about change and uncertainty; (2) is compatible with proactive and entrepreneurial leadership; and (3) effectively considers issues of scale in the decision-making process. We conclude by offering practical suggestions towards devolved leadership and improved cross-scale collaboration, and consider the possibility of a hybrid resilience and risk-based approach to coastal management and governance.

***Keywords: coastal governance, resilience thinking, decision-making, social-ecological systems, risk management, entrepreneurial leadership***

1 **1. Introduction**

2 Research shows conventional environmental and natural resource management approaches are  
3 limited in their ability to respond to the complex dynamics of coupled social-ecological systems  
4 (SEs) and the uncertainty of future change scenarios (Benson & Craig 2014; Carpenter et al. 2019).  
5 Nowhere are these failures more acute than in coastal areas, which are at the forefront of  
6 environmental and social change, but where current governance is failing to meet policy objectives  
7 (Charles 2012). Tackling these wicked problems on coastal areas requires incorporation of “a more  
8 adaptive yet principled approach to continual change” than that offered by current approaches  
9 (Benson & Craig 2014, p. 781).

10 Current approaches to environmental management are also influenced by broader economic trends,  
11 dominated by neoliberal and efficiency-based mindsets. This has led to widespread adoption of risk-  
12 based approaches, with a problematic management focus on efforts to avoid failure, leading to “fail-  
13 safe” systems instead of “safe to fail” ones (Ahern 2011). The underlying premise of risk-based  
14 approaches is that ecosystems are predictable: that social and environmental changes, and their  
15 associated risks, can be anticipated (Sunstein 2005). Such assumptions are doomed to fail and result  
16 in excessively risk-averse mindsets among decision-makers and in policy development (Bardsley &  
17 Pech 2012). Risk aversion encourages a control-oriented approach to environmental management,  
18 where organisations focus on narrowly-defined targets, preventing them from achieving their  
19 missions by inhibiting reflexive learning and innovation, and creating a sort of ‘accountability  
20 myopia’ (Ebrahim 2005). The result is government organisations that focus on easy-to-achieve  
21 outputs rather than outcomes, and shift liabilities to other governance actors, often into the future  
22 (Clement et al. 2016). The dominance of “risk-free” attitudes can weaken innovation, interrupt  
23 system progress, and undermine leadership capacity that embraces change and uncertainty  
24 (Sunstein 2005; Taleb 2012).

25 These limitations have compelled scholars and practitioners to identify and pursue governance  
26 arrangements that enable collaboration and adaptability (Olsson et al. 2006). Governance in the  
27 context of environmental management is “the system of institutions, including rules, laws,  
28 regulations, policies, and social norms, and organisations involved in governing environmental  
29 resource use and/or protection, and there are a variety of different approaches” (Chaffin et al. 2014,  
30 p. 1). Collaborative governance represents a shift from government to ‘governance’, where people in  
31 society share power with governments in decision-making and program delivery (Ansell & Gash  
32 2008). Adaptive governance provides conditions for actors to respond proactively to unforeseen  
33 changes in contexts of complexity and uncertainty (Chaffin et al. 2014). Emerging from cross-  
34 fertilisation between collaboration and adaptability, the notion of “adaptive governance” builds on  
35 adaptive management to acknowledge management control is limited by uncertainty, diversity and  
36 conflict (Dietz et al. 2003).

37 Resilience thinking has had a highly influential contribution to these shifts in approaches to  
38 governance. Resilience thinking is a concept that attempts to deliver a different understanding of  
39 coupled social-ecological systems: it involves an epistemological shift, a changed mindset, and a new  
40 rationality to management (Davoudi 2016; Walker & Salt 2006). More recent applications of  
41 resilience thinking – and its associated notions of coupled and co-evolving SES dynamics,  
42 adaptability, transformability, the adaptive cycle and panarchy – have delivered a better  
43 understanding of the complexity of how SESs function, and assist with identifying human

44 interventions in response to the uncertainty of incremental and transformational change (Adger et  
45 al. 2005; Flood & Schechtman 2014). However, applications of resilience thinking still face the  
46 challenge of being able to guide and deliver pathways for change in real-life contexts (Sellberg et al.  
47 2018), and how to handle the quirks of human agency, power relationships in society, and the perils  
48 and consequences of injustice (Lockie 2016; Sinclair et al. 2017).

49 The aim of this paper is two-fold: 1) to explore the case for why resilience thinking might improve  
50 the approach to governance of a real-life complex situation, and 2) to assess the utility of applying  
51 resilience thinking to the governance of that context. The context involves a complex, multi-layered  
52 federal political coastal governance system in Tasmania, Australia. We continue with an introduction  
53 to resilience thinking and its applications to environmental and coastal governance contexts, before  
54 describing the case study context and methods used (Section 3). Section 4 presents survey and  
55 interview research findings concerning the weaknesses of Tasmanian coastal governance, and the  
56 potential utility of resilience thinking to address them. Our discussion (Section 5) offers insights and  
57 reform options emerging from this investigation for improving the resilience capacity of coastal  
58 governance systems.

## 59 **2. Resilience thinking: Applications in environmental and coastal governance**

60 The notion of resilience was introduced to the field of ecological research as a means to challenge  
61 the conventional stability-oriented concepts of system linearity, equilibrium state and “timely  
62 recovery” (Holling 1973, 1996). Classic definitions explained resilience as an attribute or a property  
63 of an SES to respond to change and resist regime shifts , (Gunderson 2000; Carpenter et al. 2001).  
64 This interpretation of resilience is dominant in vulnerability, climate change adaptation and disaster  
65 management contexts, and refers to a measurable property of an SES with a focus on risk,  
66 “recovery” and “bouncing back”, particularly after a disaster (Cutter et al. 2008, Cutter & Finch 2008,  
67 Birkmann et al. 2013, Prior & Hagmann 2014, Rufat et al. 2015). Its narratives view resilience as the  
68 flip side of vulnerability, and a capacity for mitigating, reducing or preventing risk (Comfort 1994,  
69 Cutter et al. 2010, Flood & Schechtman 2014, Sutton-Grier et al. 2015, Fawcett et al. 2017). For  
70 example, Cutter et al. (2008) focus on community resilience as embedded properties of a social  
71 system to recover after disaster, while Martinez et al. (2017) define resilience as the capacity of a  
72 system to return to its pre-disturbed state.

73 To enhance theoretical underpinnings of resilience and integrate it with SES frameworks, Walker and  
74 Salt (2006) introduced the term “resilience thinking”. “Resilience thinking” is different from  
75 resilience as an SES attribute. It is a state of mind or an “attitude” that encourages non-linear  
76 thinking, acknowledges complexity, and embraces change and uncertainty (Folke et al. 2005,  
77 Davoudi 2016). SESs are conceptualised as being able to self-organise with associated capacities for  
78 experimentation, adaptation and transformation (Berkes 2007; Rockström et al. 2014). Resilience  
79 thinking, as adopted here, is not merely a state where SESs are resilient, but involves a frame of  
80 mind that embraces change (Armitage et al. 2017, Carpenter et al. 2019).

81 Given the constantly changing situations facing environmental managers, particularly on the coast,  
82 there is increasing interest in the potential for resilience thinking to inform and help frame effective  
83 response strategies. The pace and extent of environmental change require a forward-looking  
84 approach, an appreciation of social-ecological complexity, and the flexibility to effectively respond to  
85 uncertainty. Social and ethical factors need to be considered alongside ecological factors, and this  
86 means a diverse suite of approaches needs to be considered in deciding how to respond and who

87 acts, especially given the power dynamics inherent to a polycentric governance structure (Underdal  
88 2010; Armitage et al. 2012; Garmestani & Benson 2013; Lockwood et al. 2012). Those engaged with  
89 the resilience discourse assert its utility in these regards. Berkes (2007) argues resilience thinking is  
90 “forward-looking” and assists in developing more responsive policies in dealing with uncertain future  
91 scenarios. Others argue that resilience thinking improves capacity for informed decision-making;  
92 enhances institutional flexibility; establishes polycentric governance; develops cross-sectoral and  
93 cross-scale collaboration; enhances capacity to manage uncertainty and rapid changes; increases  
94 effectiveness of public engagement processes; enhances leadership capacity to develop long-term  
95 visions and strategies; and improves SES adaptiveness and learning capacity (Berkes 2007; Allen &  
96 Holling 2010; Fazey 2010; Benson & Craig 2014).

97 Resilience thinking has been applied to a diverse range of fields, including coastal planning  
98 (Garmestani & Benson 2013; Flood & Schechtman 2014), and social dimensions of environmental  
99 practice, planning and policy development (Benson & Garmestani 2011; Armitage et al. 2012;  
100 Davoudi & Porter 2012; Lockwood et al. 2014; Mitchell et al. 2015). These applications suggest  
101 heuristic tools associated with resilience thinking, e.g. panarchy and the adaptive cycle, usefully  
102 inform a more responsive environmental governance system.

103 Others, however, question the extent to which resilience thinking tools and heuristics borne out of  
104 studies of ecological systems can usefully analyse social system dynamics. The adaptive cycle and the  
105 concept of thresholds have come under particular scrutiny. Much of this has to do with human  
106 capacity to imagine and anticipate futures, a problematic focus on systems as bounded entities, the  
107 way the society of a particular focal and bounded SES is perceived, a consequent challenge to  
108 incorporate diversity of views and narratives of change associated with that SES, and that social  
109 transitions inherently involve power dynamics (Davidson 2010; Lockie 2016; Sinclair et al. 2017).  
110 However, proponents suggest that the application of the concept of panarchy – that dynamics at  
111 one scale are linked to and influenced by dynamics at scales above and below – actually helps in  
112 diagnosing (bounded) system health and can influence understanding of SES adaptability and  
113 transformability in the context of multiple scales (Walker et al. 2004). Panarchy is thus seen as  
114 potentially improving understanding of interactions between a focal SES and other SESs (Gunderson  
115 & Holling 2001; Benson & Garmestani 2011), and enabling decision-makers to account for scale  
116 mismatches more effectively (Berkes & Jolly 2002; Garmestani et al. 2009). More critically, those  
117 advocating resilience in practice assert its purpose is not to achieve system equilibrium or  
118 persistence, but to enable actors to identify pathways through constant change (Maru et al. 2017).

### 119 ***3. Materials and methods***

#### 120 **3.1. Cases study context: Tasmanian coastal governance**

121 Tasmania is an island state located off mainland Australia known for its pristine environment  
122 including coasts, beaches, wetlands, estuaries and saltmarshes, and its unique terrestrial and marine  
123 fauna and flora. Tasmania’s natural resources support a variety of environmental, social, economic  
124 and cultural values and pursuits. Almost 75 per cent of the state’s 509,000 population live in coastal  
125 areas, with most infrastructure and industries located near the shoreline (Department of Climate  
126 Change 2009).

127 The Australian 2011 State of Environmental Report (SOER) indicated climate change, sea level rise  
128 and rapid population growth are the main threat factors influencing Australian coastal systems  
129 (Australian Government 2011), and outlines the impacts of these drivers on coastal societies and  
130 environments. It found Australian coastal governance systems had a low capacity to respond due to  
131 poor cross-sectoral and cross-scale communication and collaboration; lack of a holistic and  
132 consistent approach; insufficient leadership for change; and inadequate overarching and consistent  
133 legislation, policy and planning framework (Australian Government 2011).

134 Under the Australian federal political system, Tasmania has a multi-level coastal governance system,  
135 with roles and responsibilities divided between organisations and through a variety of instruments.  
136 Influential actors are the Australian Government; Tasmanian Government, especially through its  
137 Department of Primary Industries, Parks, Water and Environment (DPIPWE), Department of Premier  
138 and Cabinet (DPAC) and Tasmanian Planning Commission (TPC); regional Natural Resource  
139 Management (NRM) bodies; local governments (councils); NGOs; and community groups. Their key  
140 mechanisms of influence are diverse and depend on their roles and responsibilities, and the type of  
141 coastal issues being addressed.

142 The Australian Government's main influence is through non-statutory mechanisms. It takes a  
143 leadership role in developing national-level policies, strategies and guidelines, and delivers financial  
144 and technical resources to other tiers. The Tasmanian Government is the main statutory level for  
145 environmental and coastal decision-making within its jurisdiction, being three nautical miles from  
146 the high-water mark, and influences coastal SESs more broadly through its role in developing policies  
147 such as the State Coastal Policy and other non-statutory guidelines, plans and programs. At a  
148 regional level, NRM organisations have a significant influence on environmental management and  
149 conservation. Councils are responsible for land use planning at the local level, and to develop and  
150 implement plans and programs that address local environmental management issues. Finally, NGOs  
151 and community groups are other influential actors in coastal decision-making, policy development,  
152 planning and management.

153 Cross-scale interactions between diverse stakeholders increase the complexity and dynamics of  
154 coastal SESs and the consequent complexity of coastal decision-making, policy development,  
155 planning and management. The diversity, complexity and dynamics of Tasmanian coastal SES need  
156 to be addressed and responded through the application of an effective governance system. A recent  
157 assessment of the requirements for effective governance involving the case study identified the  
158 following 16 attributes (Jozaei & Mitchell 2018):

- 159 1. Knowledge acquisition processes (multi-disciplinary knowledge gathering and/or creation)
- 160 2. Knowledge management processes (storage and delivery)
- 161 3. Knowledge sharing processes (especially with other actors)
- 162 4. Diversity of expertise (social, economic, environmental, etc.)
- 163 5. Institutional flexibility (the ability of structures and processes to respond to change)
- 164 6. Institutional learning (from past experience and considering futures, challenges and options)
- 165 7. Leadership for change (entrepreneurial leadership promoting innovation and opportunities)
- 166 8. Leadership for securing outcomes (by securing political and community support)
- 167 9. Transparent decision-making processes (including on the rationale behind decisions made)
- 168 10. Stakeholder engagement processes (for input into decision-making)

- 169 11. Conflict resolution mechanisms (for use within and between stakeholder entities)
- 170 12. Organisational partnerships (especially between coastal authorities and other stakeholders)
- 171 13. Institutional connectedness and coordination (multi-scale processes and agreements)
- 172 14. Supportive legislation (to establish goals, processes and standards and allow flexibility)
- 173 15. Distribution of power (which also enable cross-scale accountability)
- 174 16. Adaptive planning and management cycle (effective improvement strategies and practices)

175 In most cases, assessment of key governance actors relevant to the case study were identified by  
176 participants as having less than satisfactory performance against these attributes. The authors  
177 suggested improved performance could be achieved through more effective cross-scale  
178 communication and collaboration, enhanced leadership capacities to embrace change and  
179 uncertainty, enhanced knowledge systems that enable adaptive learning, and increased engagement  
180 mechanisms for public participation in coastal governance (Jozaei & Mitchell, 2018). The current  
181 paper advances this analysis by exploring the extent that resilience thinking might address these  
182 weaknesses.

### 183 **3.2. Methods**

184 A case study approach was used to examine the utility of resilience thinking in improving the  
185 effectiveness of the Tasmanian coastal governance regime. Mixed methods (a survey and interviews)  
186 were employed to increase richness of information and enable data acquisition from a variety of  
187 sources (Bryman 2015).

188 An online survey enabled formative evaluation of Tasmanian coastal governance performance  
189 against the 16 governance attributes listed above. Sampling was purposive, with participants  
190 targeted on the basis of having relevant experience and knowledge from a variety of organisations  
191 and diversity of governance levels, including from the Federal Department of the Environment and  
192 Energy (DEE); DPAC, DPIPWE, TPC; NRM South; and Clarence, Huon Valley, and Kingborough  
193 Councils. Out of nearly 200 successful invitations, 91 responses were received (around a 45%  
194 response rate).

195 A series of semi-structured interviews was conducted to generate in-depth, practical and case-  
196 specific information. An interview guide (included as supplementary material) was developed to  
197 identify the dynamics of Tasmanian multi-level coastal governance including the main influential  
198 drivers of change; governance weakness to respond; weaknesses and requirements of the regime's  
199 adaptability and transformability; and the utility of resilience thinking to inform a more effective  
200 coastal governance in Tasmania. These questions remained flexible and open-ended to allow  
201 adjustment, prompting and probing during each interview.

202 Participant selection for the interview was also purposive, with attention given to including people  
203 with a diversity of knowledge and experience relevant to the subject of the research (resilience-  
204 related concepts, environmental governance and coastal management) and from a variety of  
205 organisations. Interviewees were selected from DPIPWE, DPAC, TPC, Tasmanian Coastal Adaptation  
206 Decision Pathways Projects (TCAP), local councils, NRM South, research institutes, private  
207 consultants, NGOs and community groups. Local government interviewees were invited from  
208 Clarence, Kingborough and Huon Valley Councils. These councils were selected to enable  
209 comparison of their coastal management functions and their contributions to Tasmanian coastal

210 governance. Out of thirty-nine invitations, twenty-three interviews were completed (a total of 30  
211 hours). The interview audio files were imported into and transcribed with NVIVO 10 software. The  
212 content of transcriptions, after approval by each interviewee, were thematically coded to help  
213 identify, elaborate on and exemplify research findings.

#### 214 **4. Findings**

215 This section evaluates the key issues with Tasmanian coastal governance identified by survey  
216 respondents and interview participants, examining whether a resilience thinking approach might  
217 improve Tasmanian coastal governance effectiveness. Interviewee responses are analysed  
218 thematically to consider the potential contributions of resilience thinking to address issues and  
219 enhance effectiveness of how the governance regime responds.

##### 220 **4.1. Tasmanian Coastal Governance weaknesses**

221 A range of weaknesses in Tasmanian coastal governance system identified by survey respondents  
222 was reported by Jozaei & Mitchell (2018). These include a lack of leadership for change, especially  
223 from the Federal and State Governments; insufficient organisational flexibility; inappropriate  
224 distribution of power, particularly between the State Government and local councils; inadequate  
225 communication, collaboration and connectedness between influential organisations; lack of  
226 legislation able to support consistent and effective coastal decision-making; and poor system  
227 adaptiveness. DPAC's policy-making performance was considered poor to very poor, even though  
228 state-level policy-making is DPAC's reason to exist. Similarly, TPC was seen as performing weakly in  
229 its support for adaptive planning and management processes, even though the organisation is  
230 Tasmania's peak planning body. DPIPWE's structure was found to be inflexible, which was seen as  
231 resulting in a low capacity to respond to future changes and plausible scenarios. On the other hand,  
232 at the regional and local scale, NRM South, and Clarence and Kingborough Councils were graded as  
233 performing better than other governance actors (Jozaei & Mitchell 2018).

234 The interviews explored these weaknesses in greater depth. Interviewees were first asked to discuss  
235 the nature of change being faced by governance actors. There was a general appreciation that the  
236 challenges involve both slow and rapid dynamics, and require capacities for both adaptation and  
237 transformation. Key drivers of changes were seen as being associated with climate change, such as  
238 sea level rise, coastal erosion, impacts from storm surges and coastal inundation. These changes  
239 were compounded by drivers associated with social dynamics such as population growth and other  
240 demographic changes, and a trend towards reduced financial and human resources able to respond  
241 to change. Drivers triggering transformational change included flood, storm surges and bushfire  
242 within the biophysical realm; and the uncertainty of the future global economy, changes in the  
243 supply chain in the global food market, and changes in social-cultural values represented potential  
244 transformational changes in the social realm. For example, an interviewee from DPAC noted how the  
245 rural community in the Huon Valley had to transform their livelihoods in response to the devastation  
246 of the apple industry from overseas competition, and the need to transform to establish new  
247 industries. While most interviewees appreciated that capacities for both adaptation and  
248 transformation are needed, some were particularly concerned about the intensity of change  
249 associated with transformation in the coastal zone: *"Eventually, people need to think about*  
250 *transformation capacity."*

251 Building on this context, discussion in interviews explored the weaknesses of the governance regime  
252 and how it could be improved. Thematic analysis revealed three dominant and interrelated issues  
253 that warrant further consideration for exploring the potential utility of resilience thinking:  
254 governance approaches and leadership attitude; decision-making system (including policy  
255 development, planning and management processes); and system adaptiveness and transformability.

256 **Governance approaches and leadership attitude:** A majority of participants indicated a tendency for  
257 Tasmanian governance actors to adopt risk-based approaches in coastal management, particularly  
258 by those in government organisations. Interviewees expressed concern that such approaches are  
259 defensive, offer simple solutions to complex problems, and fail to consider the broader context. An  
260 associated overreliance on strategies to predict future changes created false assumptions, resulting  
261 in a misleading desire to control change rather than embrace it. Such approaches resulted in reactive  
262 leadership, which seeks to minimise losses rather than optimise gains. An inability among leaders to  
263 foster realistic understandings of future scenarios, and to develop effectively responsive strategies,  
264 was seen as undermining decision-making and a capacity for innovation, and thus lowering system  
265 flexibility and weakening adaptability and transformability.

266 As a remedy, interviewees suggested a more strategic and holistic governance approach could  
267 accommodate complex dynamics and future uncertainty. They sought proactive and entrepreneurial  
268 leadership able to embrace change, uncertainty and flexibility, and make decisions based on an  
269 appreciation of current situations, future scenarios and plausible pathways towards more desirable  
270 situations. Expansive and complex thinking in leadership needed nurturing, especially among higher-  
271 level Federal and the State Governments. Instead, interviewees saw their political leadership  
272 functioning in a “state of denial”, preventing reform, hindering the development of effective policy  
273 frameworks, and hampering implementation of responsive strategies. Interviewees recognised that  
274 a more proactive leadership would also have positive responses to other governance problems, such  
275 as the unavailability of resources and inadequate inter-organisational collaboration. Clarence Council  
276 exemplified such desirable leadership for some. Having acquired a good understanding of their  
277 situation and resources, the leadership at Clarence Council knew to bypass conventional  
278 bureaucratic procedures and source funds directly from the Federal Government.

279 **Decision-making system:** An absence of strategic thinking and scale mismatches were thought to  
280 undermine important procedural aspects of coastal management decision-making and policy  
281 implementation. Risk-based approaches were seen as encouraging local-level responses,  
282 undermining the delivery of a consistent, long-term vision and strategy needed for system-wide  
283 decision-making at state and national levels. In particular, interviewees criticised the lack of current,  
284 valid and consistent policy-making and planning instruments, such as an up-to-date state-level  
285 coastal policy, and saw this as increasing the risk and liability of decision-making. One local  
286 government interviewee noted that: *“under this climate [lack of clear policy instruments and  
287 inadequacy of leadership support], doing nothing is the best option”*.

288 Inappropriate distribution of power, accountability and liability between various levels and  
289 organisations in the process of coastal governance was another key weakness preventing strategic  
290 and consistent decision-making. Many interviewees argued that the current coastal governance  
291 system is top-down, with roles and responsibilities not well distributed among organisations with  
292 influence. Interviewees from local governments and NGOs indicated that despite the significant roles



293 of local governments in coastal planning and management on a local scale, these organisations do  
294 not have adequate decision-making accountability. Inadequate communication, collaboration and  
295 connectedness between different stakeholders was not conducive to developing polycentric  
296 governance arrangements needed to nurture collaborative and effective strategies for coastal area  
297 management.

298 **System adaptiveness and transformability:** Interviewees confirmed weaknesses in governance  
299 arrangements for effective adaptive planning and management; also a feature of the survey results.  
300 Adaptive planning and management is a cyclic and forward-looking procedure that emphasises  
301 “learning by doing” (Armitage et al. 2009). Interviewees suggested that adaptive capacity was  
302 lacking at all stages of Tasmanian coastal governance: in planning, implementation, learning and  
303 responding. Insufficient capacity to acknowledge change and uncertainty compounded weakness in  
304 adaptive capacity, as did the inability of planning and policy instruments to deal with future  
305 scenarios. Also, insufficient operational programs and on-ground projects – due to lack of leadership  
306 support – was preventing accumulation of knowledge and information conducive to adaptive  
307 learning. Risk-averse approaches and reactive leadership were also seen as preventing deliberate  
308 and proactive consideration of transformability in the governance system. At best, the existing  
309 governance system could only respond to radical changes with reactive strategies, such as post-  
310 disaster emergency management and recovery plans.

#### 311 **4.2. Potential contributions of resilience thinking to respond to governance weaknesses**

312 Although a number of interviewees identified some restrictions and complications in applying  
313 resilience thinking in practice, the analysis of interview data suggested that resilience thinking is a  
314 suitable approach for dealing with the complex dynamics of coastal SESs in Tasmania, particularly for  
315 higher scale decision-making. In this respect, a comparison between the utility of resilience thinking  
316 and risk-management (as the most common governance approach) revealed some noteworthy  
317 insights.

318 **Resilience thinking is open to change and uncertainty:** ~~The li~~ interview results showed that, in  
319 comparison with risk-based approaches, resilience thinking is more open to change and uncertainty.  
320 As an academic participant argued: “*there is a degree with risk management where you want to  
321 build certainty, but resilience is all about recognising uncertainty*”. Also, to address this feature, a  
322 former State Government employee mentioned that: “*with resilience, I do not feel I am in the castle  
323 anymore, I feel like something more open. A more open system*”. Resilience thinking enables an  
324 approach that focuses on supporting system functions in a more holistic and flexible way rather than  
325 controlling a narrow set of attributes and risk factors. An academic interviewee explained that  
326 “*resilience is the capacity to respond to the change as it occurs; no matter the magnitude of the  
327 change*”. As a result, resilience-based governance has the capacity to develop flexible responses  
328 according to uncertain future scenarios and potential risks. As a TPC interviewee noted: “*resilience is  
329 flexibility and keeping the gates open – keeping the options open to deal with an uncertain future –  
330 holistic in terms of understanding what the scenarios are [and] what the future could hold*”.

331 **Resilience thinking is compatible with entrepreneurial leadership:** Interviewees indicated that  
332 resilience thinking is more compatible with the complex and unpredictable nature of coastal SESs  
333 and could assist with delivering more proactive responses. For example, a former state government  
334 employee noted that resilience thinking is: “*much closer to reality ... the difference [between risk*

335 *management and resilience thinking] to me is you haven't got the hard boundaries; you are not*  
 336 *defensive, you are more responsive". Resilience thinking allows leaders to identify "windows of*  
 337 *opportunities" for future progress and development, and enhances the capacity to explore*  
 338 *innovative responses to emerging transformational changes. Resilience-based governance could*  
 339 *more readily adapt to social and environmental changes, and even facilitate regime shifts, as*  
 340 *required, to maintain or strengthen desired system functions.*

341 **Resilience thinking can address scale mismatches in decision-making:** Interviewees suggested  
 342 resilience thinking offers a more suitable strategy for dealing with large-scale and complex problems  
 343 where the uncertainty is higher. By contrast, risk management was seen as more practical for  
 344 addressing local-level management issues. One academic interviewee suggested that while: *"risk*  
 345 *management has more utility on low-scale projects like coastal management ... a resilience approach*  
 346 *could be more appropriate in higher scale/level decision-making and policy development".* Another  
 347 interviewee with federal-level experience agreed with the difference in utility at different scales:  
 348 *"risk management at the management scale and resilience thinking approach on the policy-making*  
 349 *scale".* Given these potential complementarities, most interviewees expressed interest in exploring a  
 350 hybrid application of resilience thinking and risk management in decision-making and policy  
 351 development. Some confirmed that a risk management approach at a local level provides knowledge  
 352 feedback for larger scale decision-making and policy development, thus improving governance  
 353 effectiveness. However, an emphasis was placed on prioritising application of resilience thinking  
 354 over risk management approaches. For example, a private consultant participant suggested in  
 355 putting the two together that *"I think the first thing is you focus on the resilience of the system ... my*  
 356 *risks depend on my resilience."*

357 Table 1 summarises participants' responses about the weaknesses of the Tasmanian coastal  
 358 governance and potential utility of resilience thinking to respond.

359 **Table 1. Summary of findings: Governance weaknesses and potential utility of resilience thinking**

<b>Themes</b>	<b>Key weaknesses of the governance system</b>	<b>Potential contributions of resilience thinking to respond</b>
<b>Governance approaches and leadership attitude</b>	<ul style="list-style-type: none"> <li>- unrealistic understanding of SES characteristics and overreliance on the predictability of drivers of change</li> <li>- domination of risk-averse, defensive and command and control governance approaches</li> <li>- lack of open and proactive leadership</li> <li>- non-responsive, partially responsive and reactive responses</li> <li>- the negative perception of change and inability to find "windows of opportunity" when changes occur</li> <li>- undermined innovation and novelty in the leadership, and subsequently, in the entire system</li> </ul>	Resilience thinking: <ul style="list-style-type: none"> <li>- is more compatible with the complex and unpredictable nature of coastal SESs</li> <li>- is not risk-averse, acknowledges change and uncertainty, and is more open to them</li> <li>- is holistic, yet inclusive and relatively independent to particular risk factors</li> <li>- provides flexible responses according to uncertain future scenarios and potential risks</li> <li>- encourages proactive leadership that is capable of finding "windows of opportunities."</li> </ul>
<b>Decision-making system</b>	<ul style="list-style-type: none"> <li>- the absence of strategic thinking and fragmented decision/policy-making processes</li> <li>- the problem of scale and scale mismatches in the process of decision-making</li> <li>- Inappropriate distribution of power, accountability and liability and unclarity of roles and responsibilities undermined decision-making capacity in the governance system</li> <li>- patchy and uncoordinated decisions that are non-responsive or partially responsive</li> <li>- lack of overarching policy framework or guideline for consistent state-wide decision-making</li> <li>- slow decision-making that creates a lag between the emergence of problems and enforcing</li> </ul>	Resilience thinking: <ul style="list-style-type: none"> <li>- is more compatible with the complex and unpredictable nature of coastal SESs and could assist with delivering a more realistic decision</li> <li>- encourages proactive leadership which could make informed and proactive decision for future progress and development</li> <li>- provides a more suitable framework for dealing with large-scale and complex problems (i.e. state-level) where the uncertainty is higher</li> <li>- could strengthen cross-organisational and cross-level communication and collaboration (through the embedded heuristics such as panarchy and</li> </ul>

- responsive strategies
- inadequate bottom-up and community leadership in the decision-making process
- insufficient organisational communication and collaboration across scales
- adaptive cycle)
- is inclusive to other complementary approaches (i.e. risk management) to respond to its weaknesses (i.e. application in lower level decision-making)

<b>Adaptiveness and transformability</b>	<ul style="list-style-type: none"> <li>- interrupted adaptive planning and management cycle</li> <li>- inability to generate practical knowledge and information due to insufficient on-ground practical projects</li> <li>- inadequate adaptive learning due to insufficient knowledge and information</li> <li>- insufficient appreciation of the need to facing transformational change and improving system transformability</li> <li>- inability to generate practical knowledge and information due to insufficient on-ground practical projects</li> <li>- low system adaptiveness, lack of system transformability and incapacity to respond to transformational changes</li> </ul>	<ul style="list-style-type: none"> <li>- The concepts of adaptability and transformability are embedded in resilience thinking</li> <li>- Resilience thinking inspires transformative leadership through encouraging novelty and innovation</li> <li>- A resilience-based governance can more readily adapt to social and environmental changes, and even facilitate transformation and regime shifts, as required, to maintain or promote systems functions</li> </ul>
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360

### 361 4.3 Difficulties of applying resilience governance in coastal governance

362 The main argument against applying resilience thinking was the perceived theoretical complexity of  
 363 the framework and the difficulties of its implementation in the “real world”. This complexity and  
 364 ambiguity was seen as hindering a clear understanding of resilience as a concept, and thus limiting  
 365 its application to achieving practical management outcomes. As one academic interviewee stated:

366 *“the idea of resilience that has been constituted by Stockholm Resilience Alliance turns*  
 367 *into an extremely unbounded system problem. So, if I was a resilience SES analyst and*  
 368 *also have coastal systems here, I would include the governance system, I would include*  
 369 *the animals that live along the coast and currents that run up and down the coast and*  
 370 *will have an unbounded system which I just simply couldn’t analyse, and that is part of*  
 371 *the problem we have. Because I do not necessarily know what we are talking about;*  
 372 *Because we do not have a tightly bounded enough system... So, it is really hard to build*  
 373 *a polity around it ... and resilience language, as used in this sort of complicated*  
 374 *discussion which says now we need to have synergies, we need to develop our*  
 375 *understanding of the interrelations between different components of the system. In*  
 376 *many ways, you are setting yourself up for analysis-paralysis”*

377 In addition, a prevailing risk-averse mindset and domination of political and economic short-termism  
 378 were also viewed as major barriers to the application of resilience thinking in Tasmanian coastal  
 379 governance. Participants indicated that risk-averse attitude prevents the incorporation of more  
 380 progressive and reformist approaches. This link between a risk-averse mindset as a barrier to the  
 381 adoption of resilience thinking and the utility of resilience thinking to respond to this mindset is  
 382 further explored in the next section.

### 383 5. Discussion

384 In this section, we explore the challenges of applying a resilience thinking approach to the  
 385 complexity and uncertainty of coastal area governance. We then suggest some reform options to  
 386 facilitate resilience-based governance for coastal Tasmania and explore applications for other  
 387 coastal governance contexts.

388 **5.1. How could resilience thinking inform a more effective coastal governance approach in**  
389 **Tasmania?**

390 Our interaction with a range of actors with substantial experience in research and practice involving  
391 coastal systems suggest resilience thinking can inform more responsive strategies to deal with  
392 change and uncertainty in Tasmania. However, concern was also raised that applying resilience  
393 thinking seems to require an unbounded and overwhelming level of analysis. We explore how this  
394 concern compares with an opposing view from critics of resilience thinking that a limitation is its  
395 focus on bounded systems. How can the resilience thinking approach, as defined in this research, be  
396 usefully applied to complex bounded case studies when issues cross boundaries and the dynamics  
397 involved are multi-scalar and multi-faceted? This leads us to respond to the suggestion raised by  
398 some participants that we explore how a hybrid risk and resilience assessment approach could work  
399 in practice. Finally, we explore the link between resilience thinking and proactive, entrepreneurial  
400 and transformative leadership.

401 There is a curious conflict between those who view resilience thinking as epistemologically too ‘neat’  
402 and bounded, and those who view it as too complex and ‘messy’. What is clear is that many look to  
403 the resilience thinking approach because there is a need to build capacity to govern ‘messy’ SESs,  
404 where boundaries are not fixed, interactions are not clear, and arrangements are constantly being  
405 re-ordered (Alessa et al. 2009). What is also clear is that current applications of risk-based  
406 approaches in Tasmanian coastal areas have enabled local-level managers to be responsive to day-  
407 to-day issues, but have not been effective in responding to the scale mismatches governance actors  
408 have identified as a key weakness for Tasmanian coastal governance. Resilience thinking needs to  
409 offer a practical approach to building holistic and inclusive approaches that can inform the  
410 development of long-term, flexible and yet realistic vision and strategies.

411 We identified earlier how the practicability of “resilience theory” is subject to debate (Davidson  
412 2010; Olsson et al. 2015). Our response to the bounded versus unbounded aspect of this debate is  
413 twofold. First, it has long been recognised by resilience scholars that a resilience assessment starts  
414 by defining the system of focus (bounding it) (Walker & Salt 2006; Resilience Alliance 2010), but that  
415 the strength of the resilience assessment is to that it also looks to the scales above and below this  
416 focal system for key drivers of change (Cash et al. 2006). The cross-scale effects of changes at  
417 different scales of analysis is what the elusive term ‘panarchy’ seeks to emphasise, which offers a  
418 practical means of analysis, as already used in agricultural contexts (e.g. van Apeldoorn et al. 2011).

419 Second, we would argue that some of the critiques against resilience thinking are borne out of a  
420 misunderstanding of its principles. Resilience thinking, as applied in this research, is driven by an  
421 “integrative and uncertain” thinking style that aims to counter conventional “reductionist and  
422 certain” attitudes (Holling 1996). This principle must logically extend to reductionist thinking about  
423 society and governance. We argue that if understood and communicated clearly, the embrace of  
424 complexity by resilience thinking should be considered as one of its most useful features, and can  
425 enable coastal governance actors to “fight complexity with complexity” (Duit et al. 2010, p. 365) in a  
426 way that allows them to work through the complexity. The challenge for a resilience-based  
427 governance is to find practical strategies to overcome the complexity of multi-scale governance  
428 arrangements, and this is where a hybrid approach comes in.

429 A resilience thinking approach can be integrated with other conventional management frameworks  
430 to form a hybrid approach. This is in part because heuristics offered as part of a resilience thinking  
431 approach, such as the adaptive cycle and panarchy, can facilitate development of a hybrid or  
432 integrated approach (Angeler et al. 2016). For example, drawing on the adaptive cycle and  
433 associated panarchy heuristics, it is possible to see how a disruptive release phase ( $\Omega$ ) occurring at a  
434 local level can provide knowledge feedback for more effective decision-making at broader scales,  
435 and thus contribute to the development of a more stable growth phase ( $r$ ) across a system more  
436 broadly. Risk-based decision-making at the local level can provide knowledge and experience  
437 required for more informed and evidence-based decision-making at broader scales. This increases  
438 system adaptability, and provides the practical means to link a risk-based approach with a resilience-  
439 based approach. Also, learning from decision-making outcomes at smaller scales (both positive and  
440 negative) can help minimise irreversible and more severe impacts of decision failure at broader  
441 levels. Developing a hybrid regime in practice requires further investigation, starting with some of  
442 the reform options provided in section 5.2.

443 Resilience thinking can counteract excessively risk-averse and reactive leadership, and thus avert the  
444 current focus on creating “fail-safe” systems. Being able to recognise risks as part of a hybrid  
445 approach can nurture a type of leadership that is risk-conscious, but not risk-averse. Knowledge and  
446 information, together with community support, can equip leadership with a good understanding of  
447 risks characteristics (i.e. plausibility, severity and exposure), and nurture the cognitive capacity to  
448 manage risk at the right scale, where the consequences of decision failure are not overwhelming and  
449 irreversible.

450 An appreciation of risk and resilience can also support leaders who need to consider adaptive and  
451 even transformative changes. Entrepreneurial leaders can use resilience thinking in the context of  
452 polycentric governance to strengthen relationships across governance scales and thus build capacity  
453 to recognise and successfully navigate transformations when required (Folke et al. 2005; Olsson et  
454 al. 2006; Wilson et al. 2013). There are already several applications of resilience thinking associated  
455 with entrepreneurial leadership capable of making transformative decisions (Olsson et al. 2006,  
456 2008; Tschakert & Dietrich 2010; Wilson et al. 2013). Entrepreneurial leaders can proactively find or  
457 create mechanisms to progress the system towards resilience and sustainability through novelty,  
458 innovation and flexibility (Westley et al. 2011).

459 Our research identified greater resilience capacity among those organisations with a more advanced  
460 entrepreneurial leadership, and this develops a positive feedback loop. Entrepreneurial leadership in  
461 these organisations positively influence other governance regime attributes including use of financial  
462 resources, knowledge systems, and community engagement processes. In turn, these attributes  
463 facilitate and encourage entrepreneurial leadership in ways that enhance the resilience capacity of  
464 the entire governance system. These cyclic interactions are consistent with research findings  
465 elsewhere. For example, devolved and/or bottom-up leadership is known to improve resilience  
466 capacity and be promoted through resilience thinking heuristics such as the adaptive cycle and  
467 panarchy (Pahl-Wostl et al. 2013).

468 Participants attributed the risk-averse, defensive and reactive mindset in Tasmania’s coastal  
469 governance to two main factors: 1) lack of clear, instructive and prescriptive guidelines to inform  
470 coastal decision-making; and 2) insufficient resources (financial and human resources) to support

471 on-ground projects delivering first-hand knowledge and experience for evidence-based decision-  
472 making. This situation leads to the same self-reinforcing feedback loop as described above. A lack of  
473 knowledge and experience drives reactive leadership, making “safe” and “risk-free” inaction the  
474 norm. A defensive leadership shifts risk liabilities to other parties instead of taking proactive steps to  
475 respond to risks. Under this mindset, learning is constrained, as is managerial discretion, leading to  
476 poor performance that serves to reinforce a risk-averse approach (Clement et al. 2016). As the  
477 interview data suggested, the process of developing an effective and responsive Tasmanian State  
478 Coastal Policy (TSCP) is trapped in this type of reactive and unproductive cycle. Reforms are needed,  
479 and we suggest some below that fit with the discussion above.

## 480 **5.2. Reform options for establishing resilience-based Tasmanian coastal governance**

481 The reform options outlined below were developed to incorporate resilience thinking into  
482 Tasmanian coastal governance, building adaptability and transformability. Rather than  
483 recommending a wholesale shift to resilience thinking, the reforms scaffold on existing  
484 competencies and institutional legacy (Ansell 2011; Clement et al. 2015). In particular, it was  
485 important to acknowledge that moving away from risk aversion does not mean abandoning risk, but  
486 being conscious of it and accepting it as an inherent feature of coastal management.

### 487 **Facilitate devolved leadership and stakeholder engagement:**

- 488 • Mechanisms can be developed to allow for more bottom-up leadership where local councils,  
489 NGOs and community groups are able to influence processes of coastal decision-making. Such  
490 mechanisms include mentoring, developing communities of practice, and short course training.
- 491 • Federal and State Governments can enhance local council capacities to take more leadership in  
492 coastal decision-making and management by developing and delivering policy, planning  
493 frameworks and programs that acknowledge and guide local councils’ leadership and decision-  
494 making roles (for example, in regards to climate change impacts on coastal area)s; and by  
495 providing financial, knowledge and technical requirements to help inform councils’ leadership  
496 capacities, including through regular education programs to update the knowledge-base and  
497 capacity for informed coastal decision-making at local levels.
- 498 • Legislation, policy and planning frameworks can also explicitly identify authorities and  
499 accountabilities of regional NRM bodies and local councils, allow a degree of autonomy of these  
500 organisations to innovate and adapt, and facilitate community leadership in the process of  
501 coastal governance.
- 502 • State Government can provide resources and support to local councils and NGOs to develop and  
503 implement voluntary and community-based programs such as Landcare and Coastcare aimed at  
504 increasing public knowledge and awareness, encouraging hands-on coastal management and  
505 adaptive learning, and enhancing local and engaged leadership capacities.

### 506 **Improving cross-sectional and cross-scale communication, collaboration and cooperation:**

- 507 • DPIPWE is well-placed to offer support to practically develop cross-sectional and cross-scale  
508 collaboration opportunities. Workshops can be organised with other influential stakeholders to  
509 identify existing and potential drivers of change influencing Tasmanian coastal SESs, categorising  
510 these as incremental or transformational influences on natural and human systems, and then  
511 matching organisational roles and responsibilities to develop response strategies. Capacity for

- 512 scenario planning in state-level agencies and local councils can also be enhanced to help accept  
513 uncertainty, analyse potential futures and enhance preparedness (Oteros-Rozas et al. 2015).
- 514 • Coastal plans and programs can be developed between organisations across scales and drawing  
515 on academic expertise to enhance the level of multi-level and cross-sectoral partnerships.  
516 Priorities should be given to plans and programs between State Government, NRM regions, local  
517 councils and NGOs.
  - 518 • A coastal bridging panel with representatives of key influential organisations across scales could  
519 be established to enable the flow of information and knowledge, and facilitate intersectional  
520 and cross-scale communication and collaboration towards more collective coastal decision-  
521 making, policy development, planning and management.
  - 522 • Local governments can develop collaborative arrangements to work with each other on coastal  
523 issues and share expertise and capacity for coastal planning and implementation that draws on  
524 resilience thinking.
  - 525 • State Government agencies (DPIPWE and DPAC) can explore how to establish a new approach to  
526 risk assessment that can inform resilience-based governance. They can work with academia,  
527 NRMs, local councils and NGOs to establish the proposed hybrid risk and resilience approach,  
528 put it into practice, and share their learnings for others to benefit from.
  - 529 • The Australian Government could develop a national scale knowledge and information system in  
530 which valid, current and integrated information is easily accessible to other organisations, as  
531 well as fund coastal research and implementation projects at State and local levels.

532 These reform options offer some insights and are not exhaustive. Other reform options need to be  
533 developed and explored for other governance levels, and for different contexts. Although the  
534 features and stability characteristics of coastal SESs might vary from one place to another, the  
535 nature of coastal problems on a global scale have numerous similarities (Adger et al. 2005; Moser et  
536 al. 2012). A resilience-based coastal governance can be designed and applied at an international  
537 scale (e.g. through coastal conventions, treaties, and agreements), as well as at national, state,  
538 provincial, catchment or local scales.

539 By nurturing entrepreneurial leadership at all scales, and facilitating cross-sectional and cross-scale  
540 commination and collaboration, resilience thinking can inform how governance actors can develop  
541 more responsive policies, guidelines and directions for coastal areas. They directly address problems  
542 like those identified in Australia's State of the Environment Report: poor cross-sectoral and cross-  
543 scale communication and collaboration, lack of a holistic approach, and insufficient leadership for  
544 change (Australian Government 2011). They can also respond to the mismatch between legislation  
545 and public interests that are contributing to inadequate stakeholder engagement and the resultant  
546 deterioration of Southwest Nova Scotia lobster fishery resources (Barnett & Anderies 2014).  
547 Resilience-based governance can deliver effective responses to such governance mismatches and  
548 inadequate engagement strategies, potentially helping to deliver more transparent and democratic  
549 decision-making.

## 550 **6. Conclusion**

551 Walker and Salt (2012) argue that while resilience science is not new, practising resilience thinking in  
552 a real-world situation is. This study has provided a useful demonstration of the power and utility of  
553 resilience thinking drawing on practical knowledge of a multi-scale and multi-sector coastal

554 governance case study. Our findings advance the theory of how to apply resilience thinking, as an  
555 overarching frame of mind and thinking style, by offering new rationales and practical strategies for  
556 understanding complex SESs, and responding to uncertain, multi-faceted and multi-scalar dynamics.

557 Our analysis of the literature showed the potential utility of resilience thinking to respond to the  
558 complexity of coastal decision-making in Tasmania. The results of our investigation confirmed that  
559 resilience-thinking could be forward-looking and innovative rather than orthodox and conformist;  
560 holistic and inclusive rather than partial and comprehensive; collaborative and communicative  
561 rather than competitive and fragmented; flexible and inventive rather than rigid and prescriptive,  
562 complex and dynamic rather than simplistic and static; panarchical and polycentric rather than  
563 hierarchical and centralised; and proactive and entrepreneurial rather than reactive and risk-averse.  
564 Therefore, we suggest the resilience thinking usefully delivers an appropriate frame of mind to  
565 address the complexities of coastal governance and deliver practical responses for dealing with  
566 uncertainty. Resilience thinking can correct the risk-averse and simplicity governance mindset, and  
567 help governance actors to navigate through the complexity. We posit and explore the notion that  
568 this can be achieved through combining the best of both risk and resilience assessments, and  
569 challenge researchers and practitioners to continue exploring how to put such a hybrid approach  
570 into practice.

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