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How resilience is framed matters for governance of coastal social-ecological systems

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Abstract

Effective governance of social-ecological systems (SES) is an enduring challenge, especially in coastal environments where accelerating impacts of climate change are increasing pressure on already stressed systems. While resilience is often proposed as a suitable framing to re-orient governance and management, the literature includes many different, and sometimes conflicting, definitions and ideas that influence how the concept is applied, especially in coastal environments. This study combines discourse analysis of the coastal governance literature and key informant interviews in Tasmania, Australia, demonstrating inconsistencies and confusion in the way that resilience is framed in coastal governance research and practice. We find that resilience is most often framed as (1) a rate of recovery from disturbance or (2) the process of acting in response to, or anticipation of, a disturbance. A third framing considers resilience as an emergent property of SESs. This framing, *social-ecological resilience*, accounts for multiple configurations of SES, which necessitates adaptation and transformation strategies to address changes across temporal and spatial scales. Coastal managers recognised the value of this third framing for governing coastal SESs, yet the confusion and inconsistency in the literature was also evident in how they understood and applied resilience in practice. Expanding the use of social-ecological resilience is essential for more effective coastal governance, given the dynamics of coastal SESs and the intensity of social, economic, and environmental drivers of change these systems face. However, this requires addressing the unclear, confused, and superficial use of resilience-oriented concepts in research and policy discourse.

KEYWORDS

adaptation, coastal, environmental governance, framing, social-ecological resilience, social-ecological systems, transformation

1 | INTRODUCTION

Environmental governance requires decision making in contexts that are constantly changing, and where the nature and impacts of those

changes are highly uncertain (e.g., climate change, demographic changes, changes in development patterns and changes in social behaviour and value systems) (Armitage & Plummer, 2010; Duit et al., 2010). These issues are particularly challenging in coastal areas

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(Abel et al., 2011; Beatley, 2009). For example, rising sea levels are causing more frequent and severe flooding (Stephens, Bell, & Lawrence, 2018; Stephens, Bell, & Haigh, 2020), which increases coastal vulnerability to further climate change effects. Sea level rise, and its associated impacts, could displace 630 million people globally (Kulp & Strauss, 2019).

In addition to their vulnerability to climate change, coasts are exposed to episodic and rapid changes (e.g., flooding, hurricanes, tsunamis), and slow, cumulative, and cascading changes (e.g., saltwater intrusion, subsidence, declining economy) which are pushing many coastal environments to their limits, especially given these environments are social-ecological systems (SES) (Bernhardt & Leslie, 2013). Coastal SES have a complex set of factors influencing their dynamics, including not just biophysical but also social and economic dynamics, with their management falling across many jurisdictions, sectors, and policy portfolios and a diverse range of individuals and organisations with a stake in how they are managed. Coastal areas thus act as a nexus for many of the complex challenges that affect SES. They are centres of population growth and economic development, but also places providing critical ecosystem services (Rölfer, Celliers, & Abson, 2022).

However, despite the clear need and urgency of these challenges—and an increasingly large set of policies, plans, and programmes designed to address them—existing approaches are not sufficient (Clarke et al., 2013; Jozaei, Mitchell, & Clement, 2020). Governance provides a critical link between social and ecological systems, and it considers how decisions are made, who is involved, where and why we intervene, and thus sets the vision and direction for management (Clement, 2021).

Improving governance of coastal SES could help to address many of the issues in coastal SES, as existing coastal governance approaches tend to adopt approaches based upon community or disaster resilience, which have critical shortcomings for governing SES (Jozaei et al., 2022). Community and disaster resilience approaches often inhibit the learning and innovation required to improve outcomes for humans, and also assume risks and responses are predictable, which is out of step with the dynamics of coastal SES (Jozaei, Mitchell, & Clement, 2020). Such approaches lead to governance systems that lack the capacity and flexibility to respond to emerging problems in coastal SES, which are characterised by high uncertainty and often require engaging with novel approaches to governance composed of diverse networks of individuals and organisations (Moser, Williams, & Boesch, 2012). Conventional strategies focused on maintaining system states or return and recovery to a pre-disturbed condition may no longer be adequate or even possible in many coastal SES (Armitage, Charles, & Berkes, 2017; Beatley, 2018). In such circumstances, transformation to new configurations may be unavoidable for many coastal SES (Chaffin et al., 2016; Armitage, Charles & Berkes, 2017; Lawrence et al., 2020).

Resilience (Holling, 1973) has been offered as a useful means to respond to deficiencies in environmental governance because it encompasses adaptation and transformation (where required) to meet desired outcomes. Adopting a resilience-based approach requires changes to governance, including changes to the way people learn about and use understanding of SES, and the multi-layered and

polycentric institutions that respond to scale and cross-scale interactions (Garmestani & Benson, 2013; Jozaei, Mitchell, & Clement, 2020). Coastal SES are of particular interest for subsuming risk-based approaches under the umbrella of resilience-based approaches to governance because coastal SES are vulnerable to natural and human disturbances that make the typical goals of resisting change in the face of perturbations more difficult (Martinez, Taramelli, & Silva, 2017). Thus, resilience-based approaches are better suited to the dynamics of coastal SES and the holistic nature of required responses (Clark et al., 2013; Jozaei, Mitchell, & Clement, 2020; Jozaei & Mitchell & 2018).

There are many overlapping definitions of resilience across multiple fields (c.f., Chaffin et al., 2016 in governance; Garmestani et al., 2019, 2019 in law; Masten & Obradovic, 2008 and Masten, 2007 in psychology and development; Berkes & Ross, 2013 in community resilience), which is a significant problem for using resilience for governance of SES. Resilience research has been fragmented by competing definitions of resilience from different disciplinary traditions (i.e., return and recovery vs. multiple regimes and transformation), and has been frequently used as a generic term or a buzzword, when stakeholders may be talking about completely different types of resilience (Allen et al., 2019). Differing definitions of resilience inevitably create confusion, and more importantly, can lead to catastrophic problems for coastal governance in light of accelerating climate change (Allen et al., 2019).

Here, we focus on resilience (*sensu* Holling, 1973) as an integrated way of thinking about SES, and why this framing is critical for governance of SES in the Anthropocene. Hereafter referred to as *social-ecological resilience*, this framing of resilience is based on the understanding that resilience is an emergent property of ecosystems (Holling, 1973), to one that expanded to account for coupled systems of humans and nature (Allen et al., 2019; Carpenter et al., 2019; Folke, 2016; Folke et al., 2010; Garmestani & Allen, 2014; Gunderson et al., 2012; Holling, 1996). Our paper illuminates the key differences between types of resilience, and the potential implications for decision making for SES, backed with a discourse analysis of the literature and key informant interviews from practitioners in Tasmania, Australia. Our work supports the findings of other researchers (Allen et al., 2019; Jozaei et al., 2022) that *social-ecological resilience* is an essential framing for governance of SES, with critical implications for coastal areas, in the face of accelerating climate change.

2 | METHODS

This study investigated different framings of resilience because of the critical impact these different perspectives have on governance of SES. Framing, as we discuss in this paper, refers to how a concept is defined, conceptualised, and perceived to create a meaning for a phenomenon (Putnam & Holmer, 1992). Also, framing refers to the fine differences in the definitions or scope between concepts (Kahneman & Tversky, 2013; Scheufele & Iyengar, 2012). Framing is of material importance in governance, as how a subject is framed

shapes the ways in which facts, values, and interests are translated into action, as well as shaping who is involved and what solutions are favoured. Framing is equally important as a linguistic tool because it determines what elements of a narrative about 'how things should be done' are made salient to actors involved in governance (Clement 2021). The methodological focus on discourse in both literature and practice here thus provides insights into how ideas about resilience have both material and rhetorical impact on governance. To explore how different framings of resilience have been applied in the coastal governance sphere, and the influence of these framings in informing governance responses in practice, we adopted a qualitative two-stage analytical approach combining a discourse analysis of the literature, and semi-structured interviews with coastal governance and management stakeholders in Tasmania, Australia.

As the field of research on social-ecological resilience has matured, it has become clear that this is an important issue, i.e. the need to understand the different ways of conceptualising resilience in governing SES, and how these general ideas influence (or do not influence) coastal governance practice. We conducted a qualitative two-stage analytical approach that combined a form of critical discourse analysis (CDA) and key informant interviews (Hajer, 2005; van den Brink & Metze, 2006; Weiss & Wodak, 2007). CDA is often used to uncover how discourses are produced, interpreted, and shared by actors, and to understand how concepts are applied within—and shaped by—the broader social-political and environmental context (Catalano & Waugh, 2020). In CDA methods, the emphasis is placed on identifying sets of discourses that emerge and coalesce over time and at different scales, and then critically analysing the implications of the emergent sets of discourses on policies and practices (Catalano & Waugh, 2020). Rather than dwelling on the particulars of individual papers, CDA calls for a thematic analysis to reveal assumptions and rhetoric embedded in discourse. Our analysis focused on the framing element of CDA. Analysing language in this way not only helps to reveal multiple layers of framing, but also how different framing strategies can function in practice (Tannen 1993).

For the first stage, relevant empirical, conceptual, and review papers were analysed in the CDA to understand the diversity of definitions in the resilience literature. We first undertook a comprehensive literature search and selection in Web of Science for "coastal" AND "governance" AND "resilienc*" OR "resilience thinking" for literature since 2000. This included previous literature reviews (c.f., Davidson et al., 2016; Moser et al., 2019; Olsson et al., 2015). Articles for further in-depth critical analysis were selected based on three factors: relevance, representativeness and chronology (see Supporting Information). Relevance ensured we captured multiple discourses of resilience specific to coastal governance, but excluded papers that had a narrow focus (e.g. on coastal infrastructure). To ensure the major influential discourses were covered, the articles were sorted by abstracts and keywords, taking into account citation metrics, to ensure they were representative of the range of relevant discourses. Finally, selecting articles that were chronologically distributed across the 20 years analysed enabled us to analyse when discourses appeared and evolved over time. So, a particular discourse might have been dominant at a particular period and was then superseded by a

new discourse that became more dominant, especially during the early stages of conceptual development. The text of the resulting papers was then thematically analysed according to research focus, key concepts used, and how resilience was characterised. In relation to this last point, the analysis was focused on whether resilience (*sensu* Holling) had been used as an integrative way in relation to coastal governance, and whether transformation had been included (see Supporting Information for more details).

Analysis of formal texts alone are not sufficient for a CDA, as discourses need to be situated within a social context to be understood (Jørgensen & Phillips, 2002), so the second stage applied this methodological principle by examining the different framings that emerged in the Tasmanian coastal context. This involved analysing qualitative data from a more comprehensive, in-depth investigation of resilience and coastal governance (Jozaei & Mitchell, 2018; Jozaei et al., 2020). Key actors in Tasmanian coastal governance participated in this mixed methods case study, including 23 representatives from Tasmanian Government agencies, local governments, the private sector, academia and non-government organisations (NGOs), representing a majority of the 29 local councils in Tasmania. Transcripts from these 1765 hours of recordings provided a rich dataset for understanding how discourses are situated within the Tasmanian coastal context and provide detailed insights into how practitioners frame applications of "resilience". The categories identified in the literature provided a set of 'a priori' codes, from which a thematic analysis of interview transcripts was undertaken to identify emergent themes that provided a richer understanding of how these perspectives manifested in a live example (Creswell, 2013). This analysis employed abductive reasoning to deliver the most likely explanation for an unknown phenomenon given contexts of imprecision and uncertainty (Thagard & Shelley, 1997; Walton, 2014). The purpose of this two-stage process was to deconstruct discourses, principally to uncover different framings of resilience in coastal governance and how they influence practical application.

Coastal governance in Australia is a topic of critical importance, as 85 percent of Australians live in the coastal zone, and severe impacts of climate change are already evident across 45 percent of the coastline, compounding the already significant human impacts on these systems (Babcock et al., 2019). The changes observed so far have led the country to experiment with resilience-based approaches and integrate them alongside more traditional engineering approaches (Garmestani et al., 2019b). As an island state with high levels of biodiversity, Tasmania provides a useful example because its coastal communities and ecosystems are highly valued yet also highly vulnerable to climate change. As a state in a cooperative federalist system, it also has considerable autonomy over its decision making at the state level, whilst still needing to involve national, local, and individual stakeholders in governance. The state was an early leader among Australian states, assessing the vulnerability of its coastline in 2004 and 2006, which influenced national coastal resilience policy; however, it still lags in the development of detailed coastal resilience policies and plans (Dedekorkut-Howes, Torabi, and Howes, 2021). Thus, Tasmania has all the social, economic, and ecological pressures of a typical governance system, but also has the power to adopt

resilience-based coastal governance with substantial autonomy with respect to lower and higher-level pressures.

This tiered approach of analysing discourses at a high level and then drawing out discourses within a particular context also enhances the validity of the results because practitioners anchor framings to the context(s) in which they work. Practitioners can be open to certain ideas in theory, but reluctant or unable to implement them in practice, especially if they diverge significantly from conventional management paradigms (Pelai et al., 2021). By seeking views of embedded actors, this ensures resilience is considered not just as an abstract concept, but linked to where, how, and why practitioners intervene in coastal SES. This is one reason why discourses about resilience change when they are anchored to a particular decision context. Individuals use frames to structure their knowledge, values, and rules about the social-ecological system they are governing (Gorddard et al., 2016). Anchoring our investigation of resilience framing to coastal SES in Tasmania, an island state where coastal resilience is an urgent and salient issue, ensures we are understanding discourses as they are animated *within* a decision-making context. This contribution is important because it provides a richer understanding of how resilience is framed in a coastal governance context, which sets the agenda, structures decision-making, and influences which interventions and options are on (or off) the table (McEvoy et al., 2013).

3 | RESULTS

This section focuses first on reporting the results of the CDA of the literature, outlining how resilience is framed with respect to coastal governance. We then move on to the thematic analysis of the interview transcripts to reveal how these general discourses were translated into specific ideas about how resilience should be applied to governance in Tasmania.

3.1 | Resilience in the coastal governance literature

Since the emergence of resilience in the ecological and environmental literature (Holling, 1973), multiple definitions of resilience have emerged. Terms used have different connotations, and include: resilience (Holling, 1973), ecological resilience (Gunderson, 2000; Holling, 1996), social resilience (Adger & Hodbod, 2014), community resilience (Cutter, Boruff, & Shirley, 2003), disaster resilience (Paton & Johnston, 2006), specific resilience (Janssen, Anderies, & Ostrom, 2007), general resilience (Carpenter et al., 2019; Folke, 2016), resilience thinking (Curtin & Parker, 2014; Walker & Salt, 2006), and social-ecological resilience (Adger et al., 2005; Allen et al., 2019; Garmentani & Allen, 2014; Walker et al., 2004). While these resilience-oriented concepts have some similarities, their underpinning assumptions, arguments, and framings can differ significantly. Definitions of resilience are diverse, ideas sometimes overlap, and the links and divisions between

them are multi-dimensional (Davidson et al., 2016; Davoudi, 2012; Xu, Marinova, & Guo, 2015).

Allen et al. (2019) clarified these issues by laying out three distinct definitions of resilience when dealing with linked systems of humans and nature (SES): *resilience as a rate*; *resilience as a process*; and *resilience as an emergent property*. The discourse analysis confirmed these three very different framings of resilience for SES, and the dominance of the first two. *Resilience as a rate* is a normative notion (greater resilience is desirable) drawing on engineering perspectives of elasticity (resiliency), resistance to change (robustness), and rate of recovery to an optimum equilibrium state (Allen et al., 2019). It is common in the literature on coastal disaster risk. *Resilience as a process* is also normative (e.g., building or enhancing resilience), and is the primary framing for community resilience and natural hazards management (Allen et al., 2019). *Resilience as an emergent property* (social-ecological resilience) accounts for the possibility of different configurations of SES (adaptation *but also* transformation) as well as scale and cross-scale interactions (i.e., panarchy; see Gunderson & Holling, 2002; Allen et al., 2014). In this framing, resilience emerges out of the dynamics inherent in SESs (i.e., multiple configurations), but the concept can also guide governance interventions (e.g., to facilitate adaptation or transformation to achieve particular goals; Allen et al., 2019).

The analysis found that *resilience as a rate* and *resilience as a process* were the dominant framings of resilience for coastal governance (see Table 1 in Supporting Information). The use of *resilience as a rate* was prevalent in early applications of resilience to coastal SES research, where it was used to parallel ideas about coastal defence and vulnerability to natural hazards and disasters (Adger, 1997, 1999; Clark, 1998; Lamson, 1986; Nicholls & Branson, 1998; Westman, 1986). Resilience, in this framing, was presented as the flip side of vulnerability, with the term described as the capacity to return or recover to the “normal” state after disturbance (Abel et al., 2011; Adger et al., 2005; Carpenter et al., 2001; Chang et al., 2018; Cumming et al., 2005; Klein, Nicholls, & Thomalla, 2003; Sutton-Grier, Wowk, & Bamford, 2015).

Resilience as a process employs risk management terminology to explore coastal system vulnerability. The keywords in this discourse included: risk, hazards, disaster, threshold, recovery, renewal, reconstruction, maintaining system state, and adaptation (Adger et al., 2005; Beatley 2009, 2018; Bernhardt & Leslie, 2013; Klein et al., 2003; Masselink & Lazarus, 2019; Touzinsky et al., 2016). Such words align with the belief that resilience is a process that can be followed in order for a coastal SES to enhance its “coping capacity”, most aligned with current risk-based approaches to governance (Allen et al., 2019). This discourse tends to focus on stability in the face of environmental change, with resilience referring to the capacity to withstand rapid, episodic or extreme disruptions (such as flooding, tsunami, storm surge), and the goal to build up or enhance resilience as a means to a particular end (i.e., preserving the existing state of the SES) (Adger et al., 2005; Flood & Schechtman, 2014; Klein et al., 2003; Lloyd, Peel, & Duck, 2013; Nordenson, Nordenson, & Chapman, 2018; Sutton-Grier et al., 2015).

A distinct feature of the *resilience as a rate* or the *resilience as a process* discourse is that transformation receives little attention or is considered a negative attribute to be avoided (Jozaei et al., 2022). Although some authors reference “transformational changes”, these suggestions relate mainly to rapid, sudden and extreme disruption factors such as flooding, tsunamis and coastal storms (Kates, Travis, & Wilbanks, 2012; Lawrence, Bell & Stroombergen, 2019). This is not transformation, as transformation is the shifting of an SES with human agency to a more desirable regime with a new set of processes and structures (Jozaei et al., 2022). The potential for transformation of an SES to a new, more desirable configuration for humans (see Chaffin et al., 2016) is essential to navigate challenges of the Anthropocene but is not adequately accounted for in the *resilience as a rate* or *resilience as a process* discourse. Either framing could be appropriate when systems have a stable equilibrium, are stationary, and/or lack thresholds, but these characteristics generally do not describe coastal systems.

Resilience as an emergent property (social-ecological resilience) is represented primarily in the literature about social-ecological resilience and resilience thinking (c.f. Berkes, 2007; Beymer-Farris, Bassett, & Bryceson, 2012; Garmestani & Benson, 2013; Walker & Salt, 2006). Social-ecological resilience encompasses the definitions under *resilience as a rate* and *resilience as a process*, but also considers threshold responses associated with multiple regimes in SES. This framing also incorporates both adaptive capacity and transformative capacity, which was lacking in the other two framings. Although this third framing is better aligned with the dynamics of coastal systems, it has not garnered as much attention in coastal governance research. “Resilience thinking” in coastal governance returned only 10 results, compared with 1323 results for “resilien*”. As we discuss below, we also found that the application of social-ecological resilience (and resilience thinking) was subject to inconsistencies and ambiguities.

One finding in the social-ecological resilience discourse was that resilience thinking can provide a wholesale re-consideration of how coastal SES are governed. Benson and Craig (2014) have provided the most comprehensive account of how resilience thinking can replace a sustainability discourse in coastal governance and policymaking. Garmestani and Benson (2013) introduced *resilience-based governance*, based on social-ecological resilience, with applications in coastal SES that accounts for scale and adaptation, while Westley et al., 2013 argue for a “theory of transformative agencies” and Armitage, Charles & Berkes (2017) discuss the importance of “transformative communities” governing coastal SES across scales. Jozaei et al. (2020) discussed the usefulness of resilience thinking as a framing for Australian coastal governance.

There were frequent inconsistencies related to the *resilience as a rate* or *resilience as a process* discourses and *social-ecological resilience*, and often fusing or haphazard application of resilience concepts. For example, Lloyd et al. (2013) applied the concept of a “social-ecological resilience framework for coastal planning”, addressing notions of “adaptive land management”, “coastal resiliency”, “resilience thinking” and “ecological and engineering resilience thinking”. However, the concepts (which reflect different definitions of resilience: for example,

resiliency is a common term in engineering resilience, whereas resilience thinking relates to the social-ecological resilience discourse) were applied to address *resilience as a process* without considering the broader scope of social-ecological resilience.

Further, Flood and Schechtman (2014) used the notion of a resilience approach, compared it with other “approaches” (such as a “vulnerability approach”), and argued that the resilience approach is more appropriate for complex adaptive systems analysis. However, their hybridisation of ecological, psychological, and engineering resilience emphasises adaptation as a process for bouncing back and has no reference to transformation. Similarly, research by Nicholson-Cole and O’Riordan (2009) and Bohensky et al. (2010) regarding how adaptive capacity and adaptive governance could be applied in coastal contexts makes no reference to transformation, and thus only encompasses one facet (adaptation) of social-ecological resilience.

An example of a research paper that encapsulates *resilience as a rate* in a coastal context is that by Sutton-Grier et al. (2015). They draw on a definition of resilience provided by the then US President as being a coastal system’s capacity to “recover rapidly from disruptions” (p. 138). Their examination of coastal resilience in the US is closer to an engineering perspective with a focus on defensive strategies such as sea walls designed to reduce risk exposure and enhance timely recovery of a coastal system. Researchers working with the concept of vulnerability are also increasingly describing strategies that resist change (Bernhardt & Leslie, 2013; Martinez, Taramelli, & Silva, 2017; Peacock, 2010). For example, Bevacqua et al. (2018) refers to Cutter et al. (2003) and define resilience as the ability to resist or recover from economic, infrastructural, or biophysical damage or change. By contrast, social-ecological resilience researchers understand that while resistance to change could increase a system’s robustness to change in the short-term or a specific spatial scale, that resistance could also undermine social-ecological resilience long-term or at larger scales (Janssen et al., 2007; Jozaei et al., 2020; Lloyd et al., 2013).

3.2 | Resilience in practice: Interview results

The interview analysis showed diverse perceptions of resilience among coastal governance actors in Tasmania, Australia. As an overall trend, *resilience as a rate* and *resilience as a process* were the primary definitions of resilience. Risk, hazards, robustness, postponing negative impacts, recovery from adversity, bouncing back, and adaptability were among the frequently addressed concepts in participants’ responses, which indicates the prevalence of *resilience as a rate* or *resilience as a process* framing.

Only three interviewees, all from academia, aligned with the social-ecological resilience discourse (i.e., *resilience as an emergent property*). For example, while the views expressed by an academic interviewee, with experience in resilience research, were favourable towards social-ecological resilience, another academic interviewee, criticised the concept for practical application (see Table 2 in Supporting Information for examples).



One interviewee with experience in natural resources management explicitly addressed resilience as a system's ability to resist change (a *resilience as a process* framing) and linked it to adaptive capacity. Another interviewee with expertise in coastal physical and geomorphological science indicated resilience is a system's robustness to natural hazards impacts (mainly physical systems like coastal geomorphology). Also, other definitions mentioned the ideas of stability, system health and strength to address resilience.

Although most interviewees, in response to a specific question, confirmed the necessity for considering transformation in Tasmanian coastal governance, only three of them, again all with academic backgrounds, were clear about the limits of adaptation and the necessity for transformation when a system is in an undesirable state. One interviewee perceived resilience as a separate attribute to transformation and asserted that resilience concepts hindered novelty and innovation and prevented decisions that facilitate transformation to a fundamentally new state (clearly at odds with a *social-ecological resilience* framing).

An interesting aspect of the interviews is that participants' articulation of the differences between adaptation and transformation and the idea of a social-ecological resilience approach (resilience thinking) seemed to improve over the course of the interview. Before the second half of the interview, which started with a question related to transformation, most interviewees described *resilience as a process*, with the goal to build resilient systems as an outcome of adaptation and recovery strategies. Aligning more with *resilience as an emergent property*, they expressed the need to plan for transformation in Tasmanian coastal governance. However, less attention was paid to deliberate and proactive transformation strategies to respond to slow variables and feedbacks induced by climate change. Several interviewees thought of transformation strategies as part of adaptation processes, as others have done in the literature (Kates et al., 2012; Park et al., 2012; Rickards & Howden, 2012; Termeer, Dewulf, & Biesbroek, 2017). But, when interviewees were specifically asked about transformation scenarios, most of them conceded that adaptation strategies were not adequate for dealing with transformation of SES.

At a later part of the interview, the concept of resilience-based governance of coastal SES was shared with the interviewees and defined as coastal governance that adopts social-ecological resilience for coastal decision-making, policy development and planning. Most of the interviewees agreed that social-ecological resilience could be useful for guiding coastal governance to more successfully deal with the dynamics of SES and the uncertainty of environmental change. These interviewees suggested social-ecological resilience would be most useful on a larger (state or federal) scale, where complexity and uncertainty of decision-making is greater.

The implication is that while some conventional approaches to coastal governance, such as risk-based approaches, are appropriate for addressing immediate problems in coastal governance, risk-based approaches are not capable of providing the holistic and inclusive approach required for system-level policymaking at larger scales and levels and over longer timeframes (e.g., state, federal). The inference

derived from these interviews is that social-ecological resilience (resilience thinking) has an advantage because it supports an open-ended and flexible frame of mind and is suitable for dealing with the dynamics of coastal SES under uncertainty. In support of this perspective, an interviewee from the Tasmanian Planning Commission said: “[social-ecological] resilience is flexibility and keeping the gates open-keeping the options open to deal with an uncertain future. Holistic in terms of understanding what the scenarios are [and] what the future could hold.” Other advantages of a social-ecological resilience approach, as mentioned by interviewees, included that it is a proactive approach; it supports novelty and innovation in leadership; it is futuristic and forward-looking; it appreciates system complexity and diversity; and it promotes cross-scale communication and collaboration.

4 | DISCUSSION

The framing of *resilience as an emergent property* (social-ecological resilience) has not received sufficient attention for governance of SES generally, and for coastal governance specifically. When social-ecological resilience is considered, the concept is often misunderstood or conflated with other versions of resilience, further muddying the waters for governance of SES (Allen et al., 2019). This trend was also evident in the first half of the interview process as well as in initial responses to interview questions about transformation and resilience thinking. The prevailing discourses in the literature and among case study interviewees revolved around defining *resilience as a rate or resilience as a process*, which both have significant limitations for coastal governance (Allen et al., 2019). Only a few papers (e.g., Benson & Craig, 2014; Garmestani et al., 2019a) and interviewees demonstrated familiarity with social-ecological resilience and its implications for coastal governance (adaptation, transformation, cross-scale interactions).

Also, our findings demonstrate that how resilience is defined impacts how governance of SES can respond to change and uncertainty. For example, for *resilience as a rate*, resilience is viewed as how quickly a SES can bounce back or “return to normal”, with no consideration of adaptation or transformation nor the fact that nonstationarity in coastal SES is especially pronounced, limiting the potential for a return to baseline conditions. For *resilience as a process*, resilience and adaptive capacity were mainly associated with the ability of governance to deliver strategies to withstand change and maintain system state, without consideration of the need for transformation moving forward in the Anthropocene. For *resilience as a process*, adaptive governance was seen as a means to reduce system vulnerability and create more resilient natural or human systems (as the outcomes of adaptive governance) and to avoid a regime shift (Abel et al., 2011; Adger et al., 2005; Beatley, 2009; Nordenson et al., 2018).

There is clearly a lack of understanding of social-ecological resilience, and its essential role for linked systems of humans and nature. Social-ecological resilience has been applied incorrectly as well as misunderstood by researchers and practitioners. For example, Hodgson, McDonald and Hosken (2015) note that “Holling's classic exposition

defined resilience to be the ability of a system to resist change in the face of disturbance...” (p. 503). However, Holling (1973) introduced the concept of ecological resilience to challenge resilience as “resistance” (robustness) and highlight ecosystem *persistence* despite change. Importantly, this is not just an academic argument or about semantics. These are different ways of framing resilience that influence how resilience is codified into policy and law, with substantive consequences for the ways in which coastal governance responds to change and uncertainty. For example, the need to consider transformation in the future was seldom mentioned in coastal governance research and Tasmanian coastal governance (before the second half of the interviews when the need to consider transformation was specifically raised). This suggests a lack of understanding of social-ecological resilience (and its underpinning notions) for coastal governance research in general, as well as in Tasmanian coastal governance. Researchers and interviewees typically understood transformation to be a system’s capacity to respond to *transformational changes* (rapid, episodic, and potentially catastrophic drivers) through adaptation strategies, rather than a deliberate shift of an SES away from an undesirable configuration (i.e., frequently flooded area, dysfunctional economy) to a more desirable configuration (see Chaffin et al., 2016). Again, this is not transformation, as transformation is the shifting of a SES with human agency to a more desirable regime with a new set of processes and structures (Jozaei et al., 2022).

When interviewees discussed social-ecological resilience and governance, most agreed that social-ecological resilience and its underpinning notions (such as adaptation and transformation) is important for more effective coastal governance in Tasmania. Rather than focusing on outcomes, social-ecological resilience emphasises thinking style, rationales, and mechanisms that enable coastal governance to make both adaptational and transformational decisions (Jozaei et al., 2020). The interviewees stated that resilience-based governance was visionary, positive, future-oriented, forward-looking, flexible, innovative, communicative, integrating and holistic; again, reflecting other voices in the literature (Davoudi, 2016; Fazey, 2010; Folke et al., 2010; Garmestani & Benson 2013; Walker & Salt, 2006, 2012). Interchangeable and arbitrary shifts between various terms that reflect different definitions of resilience (such as resilience, resiliency, robustness, resistance) were evident both in the discourse analysis (Beatley, 2009; Lloyd et al., 2013) and among Tasmanian coastal zone practitioners.

The findings also suggested a lack of consistent understanding of “resilience” within and across the literature and the interviews. For example, the discourse analysis found arbitrary shifts between different perceptions of resilience in a single paper, where researchers interchangeably used different terms that underpin different resilience definitions (Lloyd et al., 2013). These problems and a lack of understanding of social-ecological resilience have been pointed out by other scholars (Brand, 2009; Walker & Salt, 2012). The arbitrary shifts between definitions of resilience were also evident with Tasmanian coastal experts, where resilience was switched between a *resilience as a rate* and *resilience as a process* definition during interviews. Some interviewees argued that these flawed applications of resilience are a barrier that further complicates the incorporation of social-ecological

resilience in coastal governance (Allen et al., 2019). Although this shift between these two framings was identified as a key source of the problem in applying resilience, it is notable practitioners clearly recognised that coastal environments are linked systems of humans and nature. Despite slow uptake to date, participants viewed social-ecological resilience as a more suitable framing, given its potential for driving decision making and management actions that more comprehensively address the challenges facing coastal SES.

Again, the applied experience of participants underscores that this is not merely an academic argument. Accounting for social-ecological resilience is a pragmatic choice in coastal governance, given the complex dynamics of coastal SESs and the intensity of social, economic, and environmental drivers of change these systems face (Section 1). However, there are barriers to implementing such changes, including the siloing of governance systems and policies that not only limit integration, but sometimes have conflicting mandates (e.g., single species management vs. ecosystem management; see Garmestani and Benson 2013). In coastal SES there are additional barriers because resilience is now framed in many laws, policies, and programmes as a process for reducing disaster risk reduction (Singh-Peterson et al., 2015). Even though there is clearly an appetite to adopt social-ecological resilience as an overarching framing, the rhetoric of resilience being about reducing risk to climate change and natural disasters is now deeply embedded in many policy documents and this dominant framing of *resilience as a rate or process* has slowed adoption of social-ecological resilience in practice. This point is critical, as the framing of resilience (e.g., social-ecological resilience vs. disaster resilience or community resilience) by key governance actors sets the agenda, structures decision-making, and influences which interventions and policies are selected. Resilience framing thus defines the trajectory of coastal SES in multiple ways. Framing is thus not just about discourse; it has demonstrable implications for how such systems are managed and ultimately the capacity of coastal SES to adapt or transform in response to climate change.

Governance of SES has primarily revolved around the *resilience as a rate* or *resilience as a process* framing. From the perspective of political decision-makers, the preferred emergency strategies for coastal SES have primarily been to recover, build resilience, and “adapt” to a similar functional configuration (Boin, Comfort, & Demchak, 2010). These strategies are based upon *resilience as a rate* and *resilience as a process*. From a practical viewpoint, resilience has become an appealing buzzword in socio-political discourses in Australia, specifically in overarching government guidelines and policies (Australian Government, 2010, 2016, 2019). These applications mainly pinpoint *resilience as a rate* and *resilience as a process* definitions and only focus on recovery and adaptation strategies for building resilience. However, framing *resilience as a rate* or *resilience as a process* is often inadequate for addressing the vulnerabilities and dynamics of coastal SES and will likely become less useful in the face of rapidly accelerating environmental change (e.g., 20–50 years from present).

Governance of linked systems of humans and nature cannot simply focus on adapting, optimising, or mitigating one configuration of a SES, as SES are defined by the capacity to exist in multiple regimes (Gunderson et al., 2012). For example, adaptation is taking the

necessary steps to maintain the current configuration of a SES (i.e., the same processes and structures). Transformation is taking the necessary steps to shift a SES to a new configuration with different processes and structures. Adaptation and transformation are two completely different governance strategies, as adaptation is about “maintaining” or “adjusting”, while transformation is about a fundamental change in the configuration of a SES. As SES continue to erode at increasingly larger scales and faster rates, strategies (e.g., transformative governance) to facilitate transformation to more desirable configurations are needed (see Chaffin et al., 2016).

5 | CONCLUSION

Moving forward, coastal governance of SES requires strategies that consider slow, cascading and cumulative variables and feedbacks, as well as irreversible impacts induced by climate change (i.e., sea-level rise, loss of coral reefs). Social-ecological resilience addresses these cross-scale (temporal and spatial) interactions and allows for adaptation or transformation when conditions have become undesirable in the current configuration of the SES (e.g., coastal cities bombarded by frequent tropical storms and hurricanes) (Gunderson and

Holling, 2002), and resilience-based governance operates at different levels of coastal governance (depending on the governance and political arrangements of the application) (Craig, Ruhl, & Garmestani, 2020; Garmestani & Benson, 2013). With the support of knowledge provided by prior research (Allen et al., 2019), the discourse analysis and key informant interviews in Tasmania, we recommend that social-ecological resilience serve as the basis for governance of coastal SES (Figure 1). This is because resilience-based governance of coastal SES:

1. Accounts for the fact that SES can exist in different configurations, and that fact necessitates adaptation and transformation strategies required to address cumulative, cascading, and irreversible changes induced by climate change.
2. Accounts for scale and cross-scale interactions, as negative environmental outcomes are beginning to scale up (e.g., nutrient pollution causing large scale change in the northern Gulf of Mexico). Panarchy theory and new evidence shows that while some strategies informed by the *resilience as a rate* or *resilience as a process* definitions (i.e., stop-banks, sea walls, stronger pumps) could enhance resilience in the short term (e.g., 10–50 years), or at a particular spatial scale, these strategies erode resilience over the

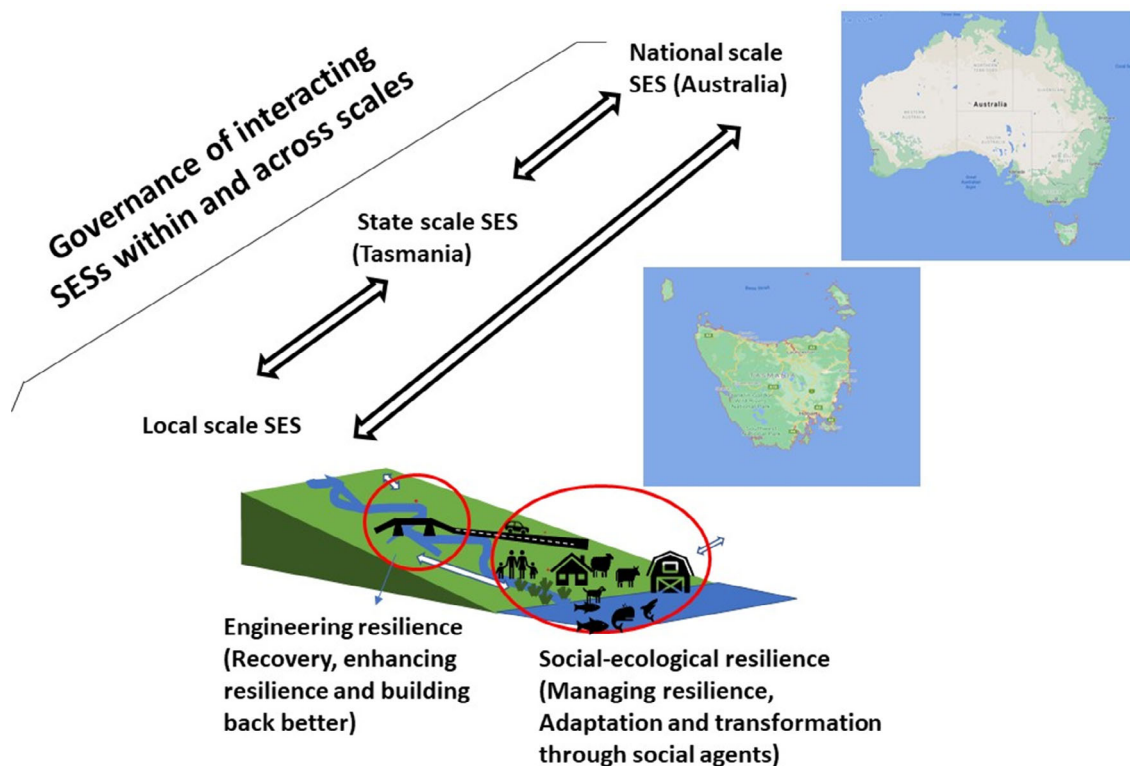


FIGURE 1 Resilience-based governance of interacting SES across scales: “Resilience” can matter in different contexts and at different scales depending upon the subject of interest. For example, if we are concerned with a bridge in isolation, we are most concerned with the engineering resilience of the bridge. However, if that bridge is being assessed within the context of the resilience of an SES (e.g., a coastal city or state), then the bridge is also subject to the social-ecological resilience of the larger scale SES. Within SESs, there can be multiple scales of organisation operating at different scales (e.g., wetland systems operating at smaller scales within a larger scale coastal SES). And so, for sound coastal governance, managing the social-ecological resilience of the larger system is critical, accounting for multiple scales and cross-scale interactions (i.e. panarchy: see Gunderson & Holling, 2002; Allen et al., 2014).

longer term or for the next larger scale in a panarchy (region or state) (c.f. Gunderson and Holling, 2002; Allen et al., 2014).

Finally, we argue that ambiguity created by buzz-wording has hindered the application of resilience in many contexts (Olsson et al., 2015; Allen et al., 2019). Such ambiguity is not due to an inherent flaw in the concept of resilience, but instead is due to unclear, confused, and superficial use of resilience-oriented ideas that fail to sufficiently account for key differences between various definitions of resilience and their applications (see Allen et al., 2019). Expanding the adoption of *social-ecological resilience* framing in governance generally, and coastal governance specifically, is essential to foster more effective responses to environmental change and navigate SES towards more desirable futures in the Anthropocene.

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SUPPORTING INFORMATION

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