



Sense of place in social–ecological systems: from theory to empirics

Vanessa A. Masterson¹ · Johan P. Enqvist² · Richard C. Stedman³ · Maria Tengö¹

Received: 19 March 2019 / Accepted: 6 April 2019 / Published online: 21 April 2019
© The Author(s) 2019

Introduction

We live in a human-dominated world and the pace and scale of changes to the biosphere, from climate change to land-use change, are staggering. Accelerated socio-economic changes accompanying global change threaten the ecological life support systems on which we depend (Steffen et al. 2015) but also the character of the particular places which we care about (Adger et al. 2011). The rapid and novel challenges of the Anthropocene are also manifested, perceived, and responded to differently in particular places, mediated by biophysical as well as social and economic facets of the place itself (Wilbanks 2015). What is the role of people's relationships to place in recognizing and responding to these sustainability challenges? Sense of place has been shown to be a key factor in adaptation to ecosystem changes and transformations, as well as playing an important role in people's motivation to act on behalf of local environments (Adger et al. 2013; Chapin and Knapp 2015; Masterson et al. 2017). The connections between people, place, and nature also help us to understand social motivations and identify and develop pathways towards sustainability (Brown 2015; Jones et al. 2016). In this special feature, we mobilize theory and empirical findings on sense of place to shed light on the

role of such relationships in the dynamics of social–ecological systems.

While there is increasing interest in the relevance and complexity of the relationship between people and place in the context of rapid and interconnected global changes defining the Anthropocene (e.g., Hausmann et al. 2016; Masterson et al. 2017; Raymond et al. 2017), the evidence is scattered. There is a need to consolidate theory, assess different methodological tools, as well as develop the evidence base for the role of sense of place in social–ecological dynamics (Stedman 2016). This work needs to be done with attention to different socio-economic and cultural contexts, as both the sense of place and the sustainability literatures are biased towards cases from 'developed' countries in the global North. Fostering stewardship of resources and land needs to be a priority across the globe, which requires understanding how different people and cultures relate to their environments. We need to examine these expressions of sense of place and its interaction with social–ecological change and how they can nurture active engagement and care of places (our focus here), biodiversity, and ecology.

Social–ecological system (SES) approaches view humans both as part of and actively shaping the ecosystems they depend on for development and well-being (Folke 2006; Folke et al. 2016; Norström et al. 2017). Responding to sustainability issues requires understanding their roots in intertwined social and ecological dynamics. This has resulted in a plethora of theoretical constructs: fast and slow variables, referring to the indicators of primary concern for managing SES (e.g., crop productivity) versus factors that underpin them and often change more slowly (e.g., amount of organic soil matter) (Walker et al. 2012); non-linear dynamics, where thresholds in a system can make a small change and can trigger a major disruption (Duit and Galaz 2008); resilience, i.e., the capacity of a system to deal with change and continue to develop (Folke 2006); stewardship, referring to strategies for sustaining ecosystem services under uncertainty and change (Chapin et al. 2010; but see Peçanha Enqvist et al. 2018 for

Handled by Osamu Saito, United Nations University Institute for the Advanced Study of Sustainability, Japan.

✉ Vanessa A. Masterson
vanessa.masterson@su.se

¹ Stockholm Resilience Centre, Stockholm University, Kräftriket 2B, 10691 Stockholm, Sweden

² African Climate and Development Initiative, Department of Environmental and Geographical Science, University of Cape Town, Private Bag X3, Cape Town 7701, South Africa

³ Department of Natural Resources, Cornell University, 101 Fernow Hall, Ithaca, NY 14853, USA

a thorough review of the concept); social–ecological traps, where undesirable dynamics in a system persist and self-reinforce (Carpenter and Brock 2008); and transformations, where actively steered activities push a social–ecological system into a different state (Olsson et al. 2004). Indeed, along with Folke et al. (2016), we view stewardship as a potential direction for sustainability transformations. Recent advances have sought to deepen scholars' engagement with the social sciences in SES research (e.g., Boonstra 2016; Hahn and Nykvist 2017). Here, we set out to contribute further to an enriching of SES research via social sciences. We do this through a concept that in itself encompasses the intertwinedness of people and nature: sense of place is expressed by individuals or groups, but developed through interactions with a biophysical reality (Stedman 2003; Masterson et al. 2017).

This special feature integrates recent advances in the interdisciplinary social sciences and humanities on sense of place, as well as the transdisciplinary body of work on resilience of SES towards a post-normal science agenda (Funtowicz and Ravetz 1993). Two recent review articles (Stedman 2016; Masterson et al. 2017) have highlighted conceptual and theoretical advances in applying sense of place to an SES perspective. These have illustrated and collated the dispersed advances in how both place attachment and place meanings are critical for motivating stewardship of natural resources, learning, and ecosystem governance. Although a useful starting point, there is a need to move beyond such conceptual discussions to present empirical evidence of the influence of sense of place on actions that affect ecosystem dynamics from local to global scales, assessed through a social–ecological lens. Together, the articles in this special feature illustrate how sense of place is moving into the realm of dealing with real-world complexity. The special feature reinvigorates ideas of the dynamism of sense of place, constantly evolving (Massey 1994, Massey 2004), and its interaction with a range of dynamic social–ecological processes such as urbanization and consequent land-use change, coral reef decline, floods, and contested management interventions. The special feature thus seeks to advance the research, but also generates an evidence base for greater recognition and application of sense of place in policy and practice.

A brief background of sense of place

The long history of work on sense of place has conceptualized and operationalized the concept in myriad ways, creating a variety of sometimes incompatible uses. Some (e.g., Jorgensen and Stedman 2006; Lewicka 2011) suggested that this relative cacophony has impeded systematic development of theory, and empirical assessments. Stedman (2016) and Masterson et al. (2017) build on this rich legacy of sense of

place research to distil out aspects of the sometimes impenetrable and disparate literature to provide some conceptual tools for using sense of place that, we suggest, are compatible with an SES lens.

The conceptualization of sense of place in both the above articles uses sense of place as an umbrella term that encompasses place attachment as connectivity with an emotional basis to a specific locale (Tuan 1977) and place meanings, as cognitive, descriptors of place (i.e., what *kind* of place it is (Stedman 2008)). Meanings in particular have been under-emphasized in empirical treatments of sense of place, often conflated with attachment (Farnum et al. 2005), but showing strong, independent prediction of place-based behaviours (Stedman 2003). In our conceptual framework, place attachment encompasses place dependence and place identity (Low and Altman 1992) as linked, but potentially distinct dimensions (Jorgensen and Stedman 2006).

In our previous paper, we also lay out key assumptions about our approach to sense of place that make it compatible with the SES perspective:

- Sense of place emerges from human interactions/experience with the environment.
- Sense of place is subjective, but its components vary systematically.
- Types of behaviour may be predicted by patterned relationships with place.

As many have begun to explore, and as we summarize in Stedman (2016) and Masterson et al. (2017), sense of place literature provides the conceptual and methodological tools to measure, understand, and assess important subjective elements of SES research. First, the measurement of place attachment provides a way to understand and evaluate the roots and motivation of protective and restorative actions towards nature (Vorkinn and Riese 2001; Stedman 2002; Andersson et al. 2007). Place attachment, however, does not tell us why one might act, or what type of action one would take. Including an analysis of place meanings can help to understand what it is about a place that people value and might seek to preserve (Stedman 2003; Davenport and Anderson 2005; Brehm et al. 2013). Second, sense of place conceptual tools can be used to map and assess patterns of variation in how, e.g., populations respond to social–ecological changes such as climate change, by assessing how measures of place attachment and meaning vary amongst different groups, across environments, and/or points in the landscape (Brown and Raymond 2007). Third, these tools have begun to be used in understanding how sense of place may influence the resilience of a system by examining how place attachment and its subcomponents influence adaptive and transformative capacity (Marshall et al. 2012; Eakin et al. 2016). Here again, considerations of place meaning are

key to understanding how social–ecological change influences whether people are willing to act on behalf of a place (Davenport and Anderson 2005; Devine-Wright and Howes 2010) and to collaborate or whether place meanings underlie community conflict (Yung et al. 2003; Chapin and Knapp 2015). Finally, sense of place offers a way to assess the subjective and relational aspects of stewardship and ecosystem management priorities; for example, measures of sense of place have been used as indicators of ecosystem services (Hausmann et al. 2016) or how ecosystem services influence the well-being of different societal groups (e.g., Smith et al. 2013). This special feature provides empirical investigations of how the above elements can be examined using sense of place theory and methods and contribute to a better understanding around SES dynamics.

Aims of this special feature

This special feature evolved through the collaboration and partnership between the Stockholm Resilience Centre, Stockholm University and the Department of Natural Resources at Cornell University. Building on mutual learning through two combined PhD courses, as well as multiple research visits in both Ithaca and Stockholm, we the editors, and our colleagues recognized the need to describe a user-friendly guide to sense of place in SESs. Our conceptual discussions found expression in two theoretical papers (Stedman 2016; Masterson et al. 2017) emerging from these courses and other interactions. These papers conclude with “research agendas” to carry these ideas forward. As such, the next logical step of this collaboration was to explore the utility of sense of place and the hypothesized uses for understanding SES with real-world empirical cases. Here, we wanted to engage with a broader set of colleagues, whose work to operationalize sense of place constructs in multi- and interdisciplinary projects we admire. A conference session at the Programme for Ecosystem Change in Society II in Oaxaca in November 2017 brought some of these authors together and provided another springboard for this special feature in Sustainability Science.

To evaluate the utility of the conceptual tools presented in these two conceptual papers, this special feature presents a series of empirical cases that all use sense of place to study social–ecological systems. Importantly, not all of the cases strictly adhere to the “attachment/meanings” framework, we articulated in our earlier works. Together, they provide an evidence base to synthesize insights on resilience and sustainability for research as well as for policy and practice. Masterson et al. (2017) identified five future research areas, where an in-depth focus on the key dimensions of sense of place will advance understanding of stewardship and transformation in SESs. In this special feature, empirical cases

will demonstrate the theoretical progress on research areas, and illustrate how these broad statements manifest in different settings, as well as facilitate an interrogation of the utility of these research areas. Based on the five themes identified by Masterson et al. (2017), we distil four broad areas of research in this editorial:

1. Whose place meanings are favoured and why and implications of these power dynamics for SESs.
2. Beyond a static understanding of the biophysical elements of sense of place towards an understanding of how non-linear ecosystem change may influence senses of place.
3. The contribution of place meanings and attachment to initiating and maintaining social–ecological traps, as well as to transformative change for stewardship.
4. Scaling up stewardship behaviour from the individual to the global.

Advancing an empirical evidence base for the role of sense of place in SESs

Introducing the scope of this special feature

The eight articles in this special feature explore expressions and uses of the concepts of sense of place and implications for sustainability beyond a current bias towards the socio-economic and cultural context and concerns of the global North. The special feature presents empirical cases from 12 countries on six continents. The articles examine the influence of sense of place and its operationalization in a variety of socio-cultural contexts spanning a gradient from urban to rural. The papers also engage with a range of social–ecological challenges: from the perceptions of flood risk and management, to conflicts around conservation and the success or failure of development interventions, and to the management of waterbodies (coastal, riverine, and marine). The articles use both broad datasets as well as in-depth historical case studies. These approaches complement each other in general and on particular comparable issues.

In the first contribution to this special feature, Quinn et al. (2019) present results from a large survey of four flood-prone coastal towns in France, South Africa and the UK. Their article examines how meanings associated with water and waterbodies relate to perceptions of flood risk and how people prefer to manage floods. Findings show how positive associations with rivers are related to perceptions of lower flood risk, and a willingness to invest in tax and insurance to cope with floods, while negative meanings were associated with the impulse to protect infrastructure from flooding.

Also in a coastal setting, Marshall et al. (2019) focus on the impact on sense of place from reports of the ecological

degradation of the Great Barrier Reef. The authors examine the social distribution of emotional responses, “ecological grief”, through surveys of residents, tourists, and fisher and tour operators (whose livelihoods depend on the reef) showing that at least half of respondents report significant impact of reef decline on their well-being. The results show that people’s place meanings shape how emotional and mental health effects are experienced which authors use to lay the foundations to examine cumulative effects of climate change on meaningful places.

Enqvist et al. (2019) study urban waterfronts in New York, USA, through interviews and Likert-scale surveys to examine place attachment and meanings in nine community-based groups. These groups work with water-adjacent sites to either restore previous place meanings, protect the existing meanings, or transform place into something new. The authors use place meanings to outline a typology of stewardship, to help better understand the different roles that civic groups can have in managing SESs.

Using a similar research approach, Murphy et al. (2019) study management of urban lakes in the rapidly expanding and riverless city of Bangalore, India. The authors investigate place-making strategies of “lake groups”, where local residents organize to advocate for restoration and maintenance of the city’s increasingly polluted lakes. The study describes how participating in stewardship reinforces people’s attachment to and broadens the range of meanings they associate with “their” lakes. Stewardship activities promoted a more complex understanding of intertwined social–ecological functions, and inspired groups to advocate for an ecosystem-based approach to management.

Ingalls et al. (2019) take us to the Malheur National Wildlife Refuge in Oregon, USA, where an armed standoff erupted in 2016 between federal enforcement agents and ranchers wishing to convert the wildlife refuge to rangeland for grazing. The authors trace the origins of this conflict through the complex histories of place claims of cattle ranchers, homesteaders, the Burns Paiute people, and federal conservationists. The authors show how complex intersecting local and regional histories influence the meanings of place and that Malheur is caught between historical notions of pristine wilderness and a romantic notion of the West as a place of resource-based traditional livelihoods. Ingalls et al. demonstrate how power, place-making, and associated place claims interact to shape material social–ecological processes over long periods of time.

Complementing this analysis, Masterson et al. (2019) examine a similar conservation–agriculture conflict on the South African Wild Coast, where the legacies of Apartheid include high levels of poverty. Their analysis follows how different groups within the local community and conservation authorities construct competing place claims through arguments for or against a proposed conservation

intervention. An analysis of the different place meanings employed in these arguments illustrates the often-talked about, but rarely demonstrated effects of ignoring the diversity of community interests, by unpacking the multiple meanings attributed to a place. The authors show how local *isiXhosa* community members use place meanings within narrative coalitions to maintain control of customary agricultural land, and successfully oppose the powerful and hegemonic discourse coalition of win–win community conservation and ecotourism imposed by white conservationists.

Briggs et al. (2019) take us to another developing context, to Guatemala, in their study of young Q’eqchi’ Maya women living in a subsistence agroecological system, where an international development project aims to preserve biocultural diversity. This study examines place attachment and illustrates how sense of place is manifested in this cultural context: positive and negative feelings towards the SES conceptualized as “magnets” and “anchors”. Authors also examine the effect of the development project on women’s attachment to this place, and what implications this has for current practices that have both maintained and slowly eroded biocultural diversity in the SES.

Lastly, Verbrugge et al. (2019) provide a comparison of how sense of place tools have been employed across five western European cases of waterway restoration projects, to understand how these tools might support participatory planning and management of river landscapes as social–ecological systems. The authors describe the range of sense of place approaches employed and discuss the relative benefits of each one, depending on whether a project aims to inform planning or evaluate psycho-social effects of restorations. Spatially explicit sense of place data is argued to have an important use for communicating the often intangible value of places to policy makers, practitioners and the general public.

Progress in advancing new research areas

In fostering integration of the tools and considerations of both sense of place and SES research, Masterson et al. (2017) suggested several key research areas for future inquiry. Here, we discuss how the papers in this special feature advance these research areas.

Theme 1: Whose place meanings are favoured and why? Implications of these power dynamics for SESs

The special feature has a strong focus on the potential of sense of place to highlight issues of power and resistance in sustainability conflicts. Sense of place provides useful tools and language for a discursive approach to tackle the ever-increasing interest of SES and sustainability research to unpack and understand the power landscapes through

which environmental change is negotiated and managed (Masterson et al. 2017). Articles in this issue have built on the legacy of sense of place research in examining whose place meanings and attachments are represented and reproduced in conflicts around competing place claims, and they have done so in ways that situate these concerns in an understanding of dynamic ecological processes and the effects on sustainability.

As Stokowski (2002) and others have demonstrated, place meanings do not compete on an equal footing: certain meanings are privileged over others, and therefore, it is critical to examine, whose place meanings dominate in contested spaces and why. The empirical work of some of the papers in this collection illustrates the power of history that manifests in narratives and meanings to shape what is normative. Quinn et al. (2019) illustrate this by showing the iterative and political nature of place meaning development and risks between residents and authorities.

Local groups make deliberate and effective use of both historic place meanings and broader discourses, as demonstrated by Ingalls et al. (2019) who trace how current day ranchers in Oregon appeal to popular romantic notions of the West as a frontier to push for their agenda: that federal lands under conservation should devolve to the state and be reopened to ranching and mining rather than conservation. Similarly, a group of farmers in the Wild Coast of South Africa study of Masterson et al. (2019) make effective use of their community's historical dispossession of the local forest land by colonial and Apartheid operatives to successfully oppose the establishment of a nature reserve on community land. The influence of broader discourses on local politics of place and vice versa as well as this influence of historical meaning on the present illustrates cross-scale processes at work.

Ingalls et al., following Creswell (1992), make the critical point that once contested place meanings are seen as 'normal', they may be taken for granted. These authors trace the histories of place claims and their impact on the landscape which in turn influences what place meanings are now possible: in many cases, dominant meanings may even have shaped social–ecological processes for long enough that alternative meanings are difficult to see or imagine. Early ranching operations in Malheur, Oregon, altered the flood irrigation which extended natural riparian functions and which later became a focal point for managing waterfowl populations in the wildlife reserve (Ingalls et al. 2019). Similar processes have formed the backdrop in cases from Bangalore and New York City (Murphy et al. 2019; Enqvist et al. 2019), where decades of urban development eventually limit the public consciousness of places' identity and potential.

Conversely, in the midst of what appears to be hegemonic influence of a place meaning, examining the range of meanings can make visible the subaltern political struggles and

their impacts on ecosystems. Masterson et al. (2019) show how a narrative from local farmers who focus on the customary value of small-scale agriculture successfully resists the powerful win–win discourse of conservation and development and implications that their land is degraded. Their narrative reveals a local emphasis on agriculture as an alternative development pathway. Ingalls et al. (2019) demonstrate how the conflict at Malheur was a flashpoint for latent meanings and claims to place to come to the surface.

Better understanding of power and conflicts, and tools to investigate and interrogate this, have direct bearing on how interventions and emerging initiatives for enhancing sustainability can be navigated, nurtured, and supported, and also help identify where certain interventions or initiatives may fail or lead to maladaptive solutions. Quinn et al. (2019) describe how by explicitly engaging the plurality of meanings that river and riverside holds, authorities can improve risk communication and ensure that risk management approaches are more inclusive. The study of Masterson et al. (2019) caution how conservation interventions are risked when the variety of local and indigenous meanings of nature are not given credence. Conversely, Murphy et al. (2019) and Enqvist et al. (2019) illustrate how the mixed use of and mutual care for place can facilitate the collaboration of quite diverse groups. Interestingly, the stewardship activities and broadened place meanings held by lake groups in Bangalore made them more inclusive of the views and traditional knowledge of villagers who often have a lower social status in urban contexts. Ingalls and colleagues take this one step further to show that conflict around multiple meanings attributed to place can also lead to new opportunities, as hidden meanings are made explicit, giving rise to new negotiations which may have surprising outcomes.

Consideration of sense of place has been used by authors in this special feature to question what is desirable for sustainability, according to whom, and to be reflexive about the imposition of western scientific frames of reference on the ways in which, e.g., indigenous groups and cultures in developing places make sense of their worlds. For example, Briggs et al. (2019) explore an uncomfortable tension in how place attachment and tradition are maintaining biocultural diversity and a sense of belonging in Q'echi' communities, but may also pose problems with reaching the limits of available resources. Simultaneously, the engagement of western values through education of young women is helping young women negotiate 'anchors' of place attachment and improve their lives through education and family planning, and may, somewhat paradoxically, help maintain the local/regional SES by giving additional livelihood options and reducing fertility rates.

Theme 2: Dynamics of SES change and their influence on sense of place

There is a need to go beyond a static view of ‘nature’ in understanding the biophysical elements of sense of place, to engage with how dynamic ecosystems influence place meaning and attachment. This requires consideration of non-linear ecological processes and other insights from studying complex SES such as cross-scale dynamics and threshold effects. Towards such an ‘ecology’ of sense of place, authors in this collection have operationalized the objects of sense of place in unique ways: Quinn et al. (2019) focus on the object of the environmental hazard of flooding (i.e., water and waterbodies) which leads them to conclude that the meanings associated with water in general are more reliably associated with flood risk perception than meanings associated with a specific waterbody. Masterson et al. (2019) describe how place meanings and associated claims are attached to landscape units defined in local vernacular: a biocultural classification system that incorporates different stages of woody regrowth in areas of agricultural abandonment. This ecologically informed landscape classification contributes to disentangling how change unfolds and the responses to those changes—including how sadness of lost farming opportunities plays into resentment of development initiatives (Masterson 2016, Masterson et al. 2019).

Social–ecological dynamics have played a critical role in creating ‘trap’ dynamics (see more below) in Bangalore’s water supply; as urbanization eroded lakes’ water quantity and quality, the meaning associated with them as a place of relevance for water security was gradually undermined (Enqvist et al. 2016). Murphy et al. (2019) demonstrate how local initiatives actively counteract this process by both promoting physical restoration and community awareness and appreciation of the lakes. Similarly, Verbrugge et al. (2019) synthesizing insights from multiple cases of environmental restoration, observe that ecological rejuvenation is often accompanied by improved infrastructure for residents and tourists to visit. Such human-driven SES dynamics can, therefore, strengthen place attachment in multiple ways: both by improving the quality of the place, facilitating access, and through dissemination of information about project outcomes.

Marshall et al. (2019) take a dynamic view of ecological processes by focusing on both one-off events of coral loss and the prospective cumulative effects of climate change on continuing decline of the Great Barrier Reef. With half of respondents already mourning the loss of the reef, even though half of it is still undamaged, the study points towards the need to understand the thresholds at which physical degradation of a place may trigger the loss of people’s relationship to it, and how that, in turn, can mobilize actions to counteract further destruction or to restore. In terms of

consequences for (mental) well-being and willingness to act to mitigate such destruction, sense of place might be just as important to monitor as actual conditions in the reef.

This theme also encompasses the influence of slow chronic versus acute changes to place and people’s ability to respond and adapt to such changes (Tidball and Krasny 2014; Masterson et al. 2017; Raymond et al. 2017). Ingalls et al. (2019) examine the slow unfolding of meanings over time, as driven both by landscape change and entrenched power interests, as well as the potential for discrete events to bring to the fore hitherto co-existing meanings. Murphy et al. provide a case, where the loss and decline of lakes were a big enough and rapid enough social–ecological change that it spurred on the need for radical stewardship actions. Here, place meanings and connection with the lakes were critical to motivating action, but the ability to act in the structural context is key too (Andersson et al. 2017). Similarly, Quinn et al. (2019) illustrate the different ways in which acute changes to place, such as floods, influence people’s perceptions of and responses to social–ecological change. These authors describe how a command and control approach to managing flooding with infrastructure in one case study town has disrupted the relationship between river meanings and flood risk. Conversely, in another town, acceptance of living with flood risk coexists with appreciation of nature and such positive meanings are also shown to be associated with a willingness to invest in tax and insurance to cope with flooding.

Theme 3: The contribution of place meanings and attachment to initiating and maintaining social–ecological traps, as well as to transformative change for stewardship

Masterson et al. (2017) suggested that further research was needed to understand the tension between fast-changing societal or environmental realities and slow-changing place meanings that people express strong attachment to (e.g., Lyon 2014) which may prevent people from adapting to these changes quickly enough. In other situations, place meanings may act as a fast variable in the system when a high social mobility results in a rapid change in place meanings which when acted upon by, e.g., newcomers to the system, may have effects on social–ecological realities. The papers in this special feature have demonstrated results in multiple different contexts as well as nuanced and advanced this research frontier. Briggs et al. (2019) describe how population pressure and unsustainable deforestation in a subsistence agroecological system in a Guatemalan community create a trap that gradually reduces the capacity of the social–ecological system to provide ecosystem services. Their analysis suggests that place attachment, particularly in the form of “anchors” to place such as traditional gendered

expectations, contributes to reinforcing and maintaining this rigidity trap. However, the authors show that the capacity building of an international development project helps young women negotiate with and change their attachment to place and go to school outside of the community and engage in family planning. These women may be key to finding ways out of the trap by transgressing the expectations of system and place and exiting these traditional resource practices, which reduces pressure on resources and helps preserve the traditional SES.

The water provision system in Bangalore also exhibits signs of a social–ecological trap, where water resources are gradually destroyed due to a combination of top–down technological investments, rapid urban development and rigid bureaucratic, and centralized management of water resources (Enqvist et al. 2016). Perceptions about identity of a system (e.g., what are the lakes, what do they function as) reinforce rigid management approaches as local actors overlook alternatives. Murphy et al. (2019) show how lake groups’ stewardship activities and their attachment to broader meanings foster a deeper social–ecological knowledge about lakes and their role in water management. The lake groups’ learning process is being guided by meanings of place that they care about, e.g., the wish to re-establish lakes as important avifaunal habitat or to protect them to ensure water supply in local wells and boreholes. This knowledge and the activities of the lake groups may help to disrupt the view of lakes that dominate the trap narrative, i.e., purely as recreational public spaces, and even enhance the ecological condition of restored lakes. Communication and innovation between lake groups and local authorities represent an increase in the adaptive capacity in the management of lakes.

The work of Murphy et al. (2019) and Enqvist et al. (2019) support Horlings’ (2016) assertion that place-making or place-shaping may represent a type of transformation towards stewardship of SESs. In Bangalore, lake groups, who started out wanting to restore the ecological function of lakes, have expanded the meaning that they attribute to the lake as also valuable in providing multiple benefits to the diverse people surrounding the lake. This has generated a more integrated social–ecological and multifunctional understanding of the lake system, influencing the management these lakes. Enqvist et al. observe a similar phenomenon: specific civic groups in New York City who were motivated to transform a site (which the authors term ‘place-making stewardship’), had either a level of detachment from the site, or were attached to a broad range of social and ecologically based place meanings. Participating in place-making work, therefore, seems to help people discover and enact the intertwinedness of social and ecological processes. These articles illustrate that considering the place meanings that drive stewardship gives a more in-depth understanding of what type of knowledge is generated and

the social–ecological impacts of stewardship actions as well as whether these changes transform the system or restore its original functions. In fact, Enqvist and colleagues demonstrate that it is not enough to measure place attachment—also considering place meanings can help describe and predict how stewardship varies and how civic activities can play a role adapting to, coping with or transforming in response to environmental challenges. This helps distinguish between alternative development pathways, which in the Bangalore case is critical for escaping the trap of increasingly degraded lakes and stressed urban water supply.

Theme 4: Scaling up stewardship and sense of place

Since the majority of sense of place literature zooms in on the ‘local’ level, there is a need to better understand how sense of place operates at broader scales and influences collective, societal-level stewardship intentions and behaviours. This includes the call by Devine-Wright et al. (2015) to examine how attachment to places at different scales influence environmental attitudes. As Nassauer (2011) suggests, care and attachment to local places may be a way to motivate stewardship at a planetary level by connecting what we see in our local environments to larger ecological systems. Marshall et al. (2019) begin to engage this as they show that the symbolic loss of a meaningful and iconic place such as the Great Barrier Reef resonates not only with local residents but also with national and international tourists. “Reef Grief” of marine resource dependent individuals was linked to concern about climate change, suggesting that further study should focus on how particular symbolic meanings associated with place may be connected with knowledge and even behavioural change, and the potential for stewardship of meaningful places as well as action to mitigate climate change (Marshall et al. 2019). Another pathway to a ‘scaled up’ sense of place may lie in the notion of attachment to a *type* of place, where people’s bond to, e.g., a forest near their home might mediate an affinity for forests elsewhere (Chapin and Knapp 2015). In Enqvist et al. (2019) stewardship groups based on recreational activities report the weakest place attachment, but also indicate a high acceptance for substituting their place with another, similar one; in other words, New York kayakers and rowers might represent a populace that have a more general attachment to a ‘type of place’ rather than to one specific site. Studying such groups could help inform how a scaled up sense of place manifests itself. More research and understanding is clearly needed in this space to further pursue our understanding of potential pathways for care and engagement to link to larger scale and interconnected phenomena.

Conclusions

The articles in this special feature illustrate the utility of the conceptual approach to sense of place as part of SES outlined by Stedman (2016), Masterson et al. (2017), and building on the rich theoretical traditions of sense of place literature, in a variety of contexts and for a variety of social–ecological issues. The papers particularly highlight that an analytical focus on place meanings is useful and even critical in the endeavour to further nuance our empirical understanding of how sense of place plays a practical role in SES dynamics. In addition, a focus on the dynamism of place has emerged, which begins to answer the calls to move beyond a static snapshot of sense of place, or a sense of place that emphasizes continuity at the expense of change (Di Masso et al. 2019). These empirical studies have a strong focus on how social–ecological dynamics such as flooding due to climate change can influence aspects of sense of place, and how place-related behaviours impact these social–ecological dynamics in turn. In addition, authors have usefully emphasized the terms ‘place-making’ and ‘place-shaping’ to draw attention to place as constantly being contested and remade (Massey 2004; Horlings 2016).

Both Stedman (2016) and Masterson et al. (2017) and many others express the hope that research on sense of place move beyond the dichotomy of methods traditionally seen in sense of place research—with qualitative constructivist and phenomenological approaches on one side of the divide, and quantitative cognitive-psychology approaches on the other. This special feature showcases empirical cases that make use of a variety of methods to assess sense of place and its influence on people’s actions in dynamic ecosystems: from large quantitative surveys, to mixed methods approaches, to historical analysis of discursively constructed meanings. We recognize the epistemological tensions in bringing these into dialogue with each other, but collecting these studies together and drawing on the number of mixed methods studies, where authors are finding innovative ways to bridge the divide, provides an opportunity for synthesis across this empirical evidence and further opportunity for discussions across this divide. Specifically, Verbrugge et al.’s (2019) comparison of river restoration projects provides several examples of how the use of different concepts and methodological approaches has a great impact on findings, for instance, depending on whether cross-case comparability or context-specific sense of place questions is prioritized. Importantly, the authors emphasize that each approach has its trade-offs, and rather than one being better than another, they are complementary.

This special feature and the ever-increasing literature on sense of place in sustainability science represent progress on the research areas identified in our previous work, and

we have noted some particular areas which we feel require more attention. First, sense of place is often local but is also the product of numerous spatial and temporal inter-scalar influences that intersect in a place. Integration of this with an understanding of panarchy in SES (Gunderson and Holling 2002) may provide some useful hypotheses for future testing. Second, considering the four themes simultaneously may generate propositions to be explored in future research. For instance, several papers indicate that escaping traps can be helped by questioning dominant place meanings (Masterson 2016; Enqvist et al. 2016; Murphy et al. 2019). It is, therefore, imperative to investigate what makes those meanings so influential, and what kinds of power structures underpin them. Third, theme 4 above remains somewhat underrepresented in our special feature, and more research is needed to understand whether and if so, how attachment to a local place can be connected with environmental concern about larger cross-scale social–ecological changes, and even promote environmental stewardship and action at higher scales and the ‘rooted cosmopolitanism’ invoked by Chapin and Knapp (2015). More broadly, it clear that we still need further empirical evidence from the Global South especially to further refine and sharpen these conceptual tools for a range of cultural expression of sense of place. We trust that this collection of articles will over time form part of an expanding empirical base that continues to refine this approach to capture multiple expressions of sense of place and its interaction with social–ecological change in the service of nurturing active engagement and care of our places, and their biodiversity and ecology.

Acknowledgements We would like to extend our thanks to the authors of the articles in this issue, and to Chloe Guerbois, Marja Spierenburg, and Corinne Knapp for useful discussions at the PECS II conference in Oaxaca in 2017. Thanks also to Keith Tidball for discussions that helped to advance these ideas, as well as Thomas Elmqvist for guidance in this process and initially bringing us together to collaborate. Mistra supported this research through a core grant to the Stockholm Resilience Centre. Vanessa Masterson is funded by Vetenskapsrådet (Swedish Research Council) Grant VR 2017-06337. The Cornell University College of Agricultural and Life Sciences and the Department of Natural Resources provided support for Richard Stedman’s sabbatical leave, which contributed to these collaborations.

Open Access This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

References

- Adger WN, Barnett J, Chapin FS III, Ellemor H (2011) This must be the place: underrepresentation of identity and meaning in climate change decision. *Glob Environ Polit* 11:1–25
- Adger WN, Barnett J, Brown K et al (2013) Cultural dimensions of climate change impacts and adaptation. *Nat Clim Change* 3:112–117. <https://doi.org/10.1038/nclimate1666>
- Andersson E, Barthel S, Ahrné K (2007) Measuring social–ecological dynamics behind the generation of ecosystem services. *Ecol Appl* 17:1267–1278
- Andersson E, Enqvist J, Tengö M (2017) Stewardship in urban landscapes. In: Bieling C, Plieninger T (eds) *The science and practice of landscape stewardship*. Cambridge University Press, Cambridge, pp 222–238
- Boonstra WJ (2016) Conceptualizing power to study social-ecological interactions. *Ecol Soc* 21:21. <https://doi.org/10.5751/ES-07966-210121>
- Brehm JM, Eisenhauer BW, Stedman RC (2013) Environmental concern: examining the role of place meaning and place attachment. *Soc Nat Resour* 1920:1–17. <https://doi.org/10.1080/08941920.2012.715726>
- Briggs L, Stedman R, Krasny M (2019) Place attachment and social-ecological system sustainability examined through the voices of indigenous Guatemalan women. *Sustain Sci*. <https://doi.org/10.1007/s11625-018-0634-6>
- Brown K (2015) *Resilience, development and global change*. Routledge, London
- Brown G, Raymond C (2007) The relationship between place attachment and landscape values: toward mapping place attachment. *Appl Geogr* 27:89–111. <https://doi.org/10.1016/j.apgeo.2006.11.002>
- Carpenter SR, Brock WA (2008) Adaptive capacity and traps. *Ecol Soc* 13(2):40. <https://doi.org/10.5751/es-02716-130240>
- Chapin FS, Knapp CN (2015) Sense of place: a process for identifying and negotiating potentially contested visions of sustainability. *Environ Sci Policy* 53:1–9. <https://doi.org/10.1016/j.envsci.2015.04.012>
- Chapin FS, Carpenter SR, Kofinas GP et al (2010) Ecosystem stewardship: sustainability strategies for a rapidly changing planet. *Trends Ecol Evol* 25:241–249. <https://doi.org/10.1016/j.tree.2009.10.008>
- Creswell T (1992) *In place-out of place: geography, ideology, and transgression*, vol 2. University of Minnesota Press, Minneapolis
- Davenport MA, Anderson DH (2005) Getting from sense of place to place-based management: an interpretive investigation of place meanings and perceptions of landscape change. *Soc Nat Resour* 18:625–641. <https://doi.org/10.1080/08941920590959613>
- Devine-Wright P, Howes Y (2010) Disruption to place attachment and the protection of restorative environments: a wind energy case study. *J Environ Psychol* 30:271–280. <https://doi.org/10.1016/j.jenvp.2010.01.008>
- Devine-Wright P, Price J, Leviston Z (2015) My country or my planet? Exploring the influence of multiple place attachments and ideological beliefs upon climate change attitudes and opinions. *Glob Environ Chang* 30:68–79. <https://doi.org/10.1016/j.gloenvcha.2014.10.012>
- Di Masso A, Williams DR, Raymond CM et al (2019) Between fixities and flows: navigating place attachments in an increasingly mobile world. *J Environ Psychol* 61:125–133. <https://doi.org/10.1016/j.jenvp.2019.01.006>
- Duit A, Galaz V (2008) Governance and complexity—emerging issues for governance theory. *Governance* 21:311–335
- Eakin H, York A, Aggarwal R et al (2016) Cognitive and institutional influences on farmers' adaptive capacity: insights into barriers and opportunities for transformative change in central Arizona. *Reg Environ Chang* 16:801–814. <https://doi.org/10.1007/s10113-015-0789-y>
- Enqvist J, Tengö M, Boonstra WJ (2016) Against the current: rewiring rigidity trap dynamics in urban water governance through civic engagement. *Sustain Sci* 11:919–933. <https://doi.org/10.1007/s11625-016-0377-1>
- Enqvist JP, Campbell LK, Stedman RC, Svendsen ES (2019) Place meanings on the urban waterfront: a typology of stewardships. *Sustain Sci*. <https://doi.org/10.1007/s11625-019-00660-5>
- Farnum J, Hall T, Kruger LE (2005) Sense of place in natural resource recreation and tourism: an evaluation and assessment of research findings. Gen. Tech. Rep. PNW-GTR-660. US Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, OR
- Folke C (2006) Resilience: the emergence of a perspective for social-ecological systems analyses. *Glob Environ Chang* 16:253–267. <https://doi.org/10.1016/j.gloenvcha.2006.04.002>
- Folke C, Biggs R, Norström AV et al (2016) Social-ecological resilience and biosphere-based sustainability science. *Ecol Soc* 21(3):41. <https://doi.org/10.5751/es-08748-210341>
- Funtowicz SO, Ravetz JR (1993) Science for the post-normal age. *Futures* 25:739–755. [https://doi.org/10.1016/0016-3287\(93\)90022-L](https://doi.org/10.1016/0016-3287(93)90022-L)
- Gunderson LH, Holling C (eds) (2002) *Panarchy: understanding transformations in human and natural systems*. Island Press, Washington D.C.
- Hahn T, Nykvist B (2017) Are adaptations self-organized, autonomous, and harmonious? Assessing the social-ecological resilience literature. *Ecol Soc* 22:12. <https://doi.org/10.5751/ES-09026-220112>
- Hausmann A, Slotow R, Burns JK, Di Minin E (2016) The ecosystem service of sense of place: benefits for human well-being and biodiversity conservation. *Environ Conserv* 43:117–127. <https://doi.org/10.1017/S0376892915000314>
- Horlings L (2016) Connecting people to place: sustainable place-shaping practices as transformative power. *Curr Opin Environ Sustain* 20:32–40. <https://doi.org/10.1016/J.COSUST.2016.05.003>
- Ingalls M, Kohout A, Stedman RC (2019) When places collide: power, conflict and meaning at Malheur. *Sustain Sci*. <https://doi.org/10.1007/s11625-019-00689-6>
- Jones NA, Shaw S, Ross H et al (2016) The study of human values in understanding and managing social-ecological systems. *Ecol Soc* 21:15. <https://doi.org/10.5751/ES-07977-210115>
- Jorgensen BS, Stedman RC (2006) A comparative analysis of predictors of sense of place dimensions: attachment to, dependence on, and identification with lakeshore properties. *J Environ Manag* 79:316–327. <https://doi.org/10.1016/j.jenvman.2005.08.003>
- Lewicka M (2011) Place attachment: how far have we come in the last 40 years? *J Environ Psychol* 31:207–230. <https://doi.org/10.1016/j.jenvp.2010.10.001>
- Low SM, Altman I (1992) Place attachment: a conceptual enquiry. In: Altman I, Low SM (eds) *Place attachment*. Springer, Boston, pp 1–12
- Lyon C (2014) Place systems and social resilience: a framework for understanding place in social adaptation, resilience, and transformation. *Soc Nat Resour* 27:1009–1023. <https://doi.org/10.1080/08941920.2014.918228>
- Marshall N, Park S, Adger WN et al (2012) Transformational capacity and the influence of place and identity. *Environ Res Lett* 7:9. <https://doi.org/10.1088/1748-9326/7/3/034022>
- Marshall N, Adger WN, Benham C et al (2019) Reef Grief: investigating the relationship between place meanings and place change on the Great Barrier Reef. *Sustain Sci*, Australia. <https://doi.org/10.1007/s11625-019-00666-z>
- Massey D (1994) *Space, place and gender*. Wiley, Hoboken
- Massey D (2004) Geographies of responsibility. *Geogr Ann B* 86:5–18

- Masterson VA (2016) Sense of place and culture in the landscape of home: understanding social-ecological dynamics on the Wild Coast, South Africa. Stockholm Resilience Centre, Stockholm University, Stockholm
- Masterson V, Stedman RC, Enqvist J et al (2017) The contribution of sense of place to social–ecological systems research: a review and research agenda. *Ecol Soc* 22:49
- Masterson VA, Spierenburg M, Tengö M (2019) The trade-offs of win–win conservation rhetoric: exploring place meanings in community conservation on the Wild Coast, South Africa. *Sustain Sci*. <https://doi.org/10.1007/s11625-019-00696-7>
- Murphy A, Enqvist JP, Tengö M (2019) Place-making to transform urban social-ecological systems: Insights from the stewardship of urban lakes in Bangalore. *Sustain Sci, India*. <https://doi.org/10.1007/s11625-019-00664-1>
- Nassauer JI (2011) Care and stewardship: from home to planet. *Landsc Urban Plan* 100:321–323. <https://doi.org/10.1016/j.landurbplan.2011.02.022>
- Norström AV, Balvanera P, Spierenburg M, Bouamrane M (2017) Programme on Ecosystem Change and Society: knowledge for sustainable stewardship of social-ecological systems. *Ecol Soc*. <https://doi.org/10.5751/es-09010-220147>
- Olsson P, Folke C, Hahn T (2004) Social-ecological transformation for ecosystem management: the development of adaptive co-management of a wetland landscape in southern Sweden. *Ecol Soc* 9(4):2
- Peçanha Enqvist J, West S, Masterson VA et al (2018) Stewardship as a boundary object for sustainability research in the Anthropocene: linking care, knowledge and agency. *Landsc Urban Plan* 179:17–37. <https://doi.org/10.1016/j.landurbplan.2018.07.005>
- Quinn T, Bousquet F, Guerbois C et al (2019) How local water and waterbody meanings shape flood risk perception and risk management preferences. *Sustain Sci*. <https://doi.org/10.1007/s11625-019-00665-0>
- Raymond CM, Kyttä M, Stedman R (2017) Sense of place, fast and slow: the potential contributions of affordance theory to sense of place. *Front Psychol* 8:1674. <https://doi.org/10.3389/fpsyg.2017.01674>
- Smith LM, Case JL, Smith HM et al (2013) Relating ecosystem services to domains of human well-being: foundation for a U.S. index. *Ecol Indic* 28:79–90. <https://doi.org/10.1016/j.ecolind.2012.02.032>
- Stedman RC (2002) Toward a social psychology of place: predicting behavior from place-based cognitions, attitude, and identity. *Environ Behav* 34:561–581. <https://doi.org/10.1177/0013916502034005001>
- Stedman RC (2003) Is it really just a social construction? The contribution of the physical environment to sense of place. *Soc Nat Resour* 16:671–685. <https://doi.org/10.1080/08941920390217627>
- Stedman R (2008) What do we “mean” by place meanings? Implications of place meanings for managers and practitioners. In: Kruger LE, Hall T, Stiefel MC (eds) *Understanding concepts of place in recreation research and management*. Gen. Tech. Rep. PNW-GTR-744. Portland, OR. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, Portland, Oregon, pp 71–82
- Stedman RC (2016) Subjectivity and social-ecological systems: a rigidity trap (and sense of place as a way out). *Sustain Sci* 11:891–901. <https://doi.org/10.1007/s11625-016-0388-y>
- Steffen W, Broadgate W, Deutsch L et al (2015) The trajectory of the Anthropocene: the Great Acceleration. *Anthr Rev* 2:81–98. <https://doi.org/10.1177/2053019614564785>
- Stokowski PA (2002) Languages of place and discourses of power: constructing new senses of place. *J Leis Res* 34:368–382
- Tidball KG, Krasny ME (eds) (2014) *Greening in the red zone: disaster, resilience and community greening*. Springer, Berlin
- Tuan Y (1977) *Space and place: the perspective of experience*. University of Minnesota Press, Minneapolis
- Verbrugge L, Buchecker M, Garcia X et al (2019) Integrating sense of place in planning and management of multifunctional river landscapes: experiences from five European case studies. *Sustain Sci*. <https://doi.org/10.1007/s11625-019-00686-9>
- Vorkinn M, Riese H (2001) Environmental concern in a local context: the significance of place attachment. *Environ Behav* 33:249–263. <https://doi.org/10.1177/00139160121972972>
- Walker BH, Carpenter SR, Rockström J et al (2012) Drivers, “slow” variables, “fast” variables, shocks, and resilience. *Ecol Soc* 17:30
- Wilbanks TJ (2015) Putting “Place” in a multiscale context: perspectives from the sustainability sciences. *Environ Sci Policy* 53:70–79. <https://doi.org/10.1016/j.envsci.2015.04.009>
- Yung L, Freimund WA, Belsky JM (2003) The politics of place: understanding meaning, common ground, and political difference on the rocky mountain front. *For Sci* 49:855–866

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.