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Whose "place" is it? Using corpus-based techniques to sketch place-based sustainability discourses in public and academic forums

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Abstract

Calls for a "place-based" approach to sustainability are increasingly common in the field of sustainability transitions and transformations (STT). To critically explore the agendas and politics a call towards place carries, we undertook a corpus-assisted discourse study (CADS) to examine a sample of public and academic texts from 2019 to 2020. Two distinct discourses about place were evident: an environmental discourse framing place as an assemblage of more-than-human constituents and an anthropocentric discourse framing place as a human community. These discourses present vastly different priorities about which species matter, what change entails, and what kind of future we should create. Our findings reflect the emergence of a discourse coalition that advocates for a place-based approach to STT, and we discuss how this viewpoint has continued to emerge since the compilation of our data. Our paper provides an overview of the discursive landscape we encountered, synthesises a central narrative about place-based STT based on what we observed, and provides a critical discussion of the tensions and opportunities that this narrative raises. In doing so, we suggest there remains an opportunity for fruitful dialogue amongst sustainability educators, sustainability practitioners, and researchers to refine what a place-based approach to STT looks like. By demonstrating an application of CADS, we hope to show how digital tools and techniques can be used to research discourses in sustainability. We outline specific opportunities to take this forward, including a broad opportunity to use web-derived corpora to help survey discursive landscapes, and a more specific application to explore discursive dynamics between communities, places, and at different spatial scales.

Keywords Place-based · Discourse analysis · Corpus assisted · Sustainability transitions · Environmental discourse · Web corpora

Introduction

References to a "place-based" approach to sustainability transitions and transformations (STT)[1] in public and academic forums focused on researching and pursuing productive social change have become increasingly common (Balvanera et al. 2017; Horlings et al. 2020a, b; Masterson et al. 2019). Despite mobilising "place" as a normative concept, the complex meanings and competing agendas that a

reference to "place" can carry often lie unclarified; the term has a long history of fuzzy use, shaped by its different meanings in everyday language, its connection to different disciplinary interests and its different interpretations across geographies and policy-making contexts (Cresswell 2004/2015; MacGillivray and Franklin 2015; Tomaney 2010).

As sustainability researchers and practitioners, we observed the emerging interest in "place" in 2019 and suspected that various agendas were converging (and potentially clashing) in the growing calls for "place-based" approaches to STT. We saw a need and an opportunity to critically analyse the similarities and differences in visions, agendas and perspectives held by proponents of "place-based" approaches and identified that a corpus-assisted research

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[1] While this field is sometimes housed under a label sustainability transitions and sometimes under sustainability transformations, this paper uses STT to acknowledge their shared foundations, interests, and scholarship and reverts to the more common 'transitions' framing in the text.

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project would be a useful method to fill this gap whilst testing and introducing corpus tools and techniques for a broader audience of sustainability researchers. Our project involved sampling texts from public and academic forums where place-based sustainability was discussed and using computational tools and qualitative analysis to study the characteristics of the discourse(s) present.

Discursive research helps the pursuit of sustainability remain critically self-aware by surfacing insights into the politics, motivations, and socio-cultural imaginaries held by different sustainability advocates and practitioners. While methods vary, sustainability discourses are typically researched through a researcher-led process of interpreting a relatively small and carefully selected body of (mostly linguistic) data (Audet 2016; Dryzek 2013; Hajer 1995; Kagan 2019). Since the early 2000s, new analytical tools and techniques have become available. These approaches, known as corpus-assisted discourse studies (CADS) (Mautner 2019; Partington 2006), harness computational power and statistical processes from corpus linguistics alongside traditional qualitative techniques of discourse analysis. CADS lets researchers explore data in new ways, enables study of new (and larger) linguistic datasets, and can introduce more objectivity, reflexivity, and rigour to qualitative arguments and observations about discourses (Baker et al. 2008). The value of integrating quantitative tools to the qualitative study of language is increasingly recognised (Baker et al. 2008, p. 297; Mautner 2019) and the opportunity it presents for researching environmental discourse has been specifically recognised and encouraged (Leipold et al. 2019).

A small but useful set of studies have integrated CADS into sustainability literature and offer precedents for this paper. Methodological research indicates that corpora built from web-queries and online texts offer untapped potential datasets to study sustainability topics (Grundmann and Krishnamurthy 2010; Wild et al. 2013). Meanwhile, research into contemporary sustainability discourses consistently suggests that "place" is a useful theme to investigate, offering insights into popular sustainability movements (Feola and Jaworska 2019), progressive US environmentalism (Waddock 2016), environmental conflicts (Horsbøl 2020), and the overarching discourse of 'sustainability transitions' (Audet 2016). Our research builds on these observations by centering discourses about "place-based sustainability", and their relationship to STT priorities, as the focus of the investigation.

This paper serves two goals. First, it helps to fill a gap in understanding about contemporary discourse(s) in sustainability by exploring how "place-based" approaches to sustainability are framed in public forums and STT literature. We analyse the types of change advocated by different discourses and discuss what this means for sustainable futures. In doing so, we also pursue our second goal of demonstrating

new methodological opportunities for sustainability science. Our results are based on a phased investigation using two datasets: (i) a corpus of documents from the public domain, constructed with an automated web-based corpus-building tool, and (ii) a corpus from academic publications, manually constructed to include academic publications that explore the connection of place-related concepts to STT literature. Our sample of STT texts is skewed towards environmental and social science contributions, as this is where we saw an interest in place most clearly emerging. Despite inherent limitations from the sample size and temporality of our data, the process and findings from our analysis, and the discussion that it enables, hold multiple points of value for sustainability researchers and practitioners with a contemporary interest in the dynamics of place, scale, and socio-cultural processes of change.

Specific questions the paper addresses are:

- What can CADS tell us about prominent discussions of place-based sustainability on the English Internet: which groups of authors are present and what kinds of perspectives and priorities do they promote about sustainability and its pursuit? In particular, what changes do they seek ("Prominent voices and perspectives about "place-based" + "change" + "sustainability" on the English Internet")*?*
- Within our sample of texts from the STT field, to what extent and in what ways are discourses about "place" similar, and how do they differ ("Academic discourses about place-based change in our sample of STT texts" and "Zooming out: comparing the public (PC) and academic (AC) discussions of place-based sustainability for similarities, synergies, and productive differences")?
- What can we learn from these similarities and differences to strengthen and/or critically discuss place-based approaches in STT ("Discussion and contextualisation of the findings")?
- How might research into place-based sustainability discourses proceed, and what role can CADS play ("Conclusions and pathways forward")?

Methodology

Before outlining our methodology, it is important to preface what CADS looks like to the reader and what it requires from the researcher to understand its claims to knowledge. CADS enables researchers to interrogate large amounts of linguistic data for patterns and comparative difference. While this engagement with language is quantitative, the process requires countless decisions and judgements from the researcher- it appears quantitative in its evidence, but the broader task of discourse analysis remains an inherently

Table 1 Datasets used in the study

Dataset	Description	Corpus size after cleaning (words)
Reference corpus (RC)	The enTenTen2018 corpus: a large and commonly used resource in lexical research. It provides a contemporary general reference of English on the Internet	21,926,740,748
Public corpus (PC)	A specialist corpus built using Sketch Engine's WebBootCaT tool based on the search terms: "place-based", "change", and "sustainability" (compilation date: 2021-01-14)	170,189
Academic corpus (AC)	A specialist corpus constructed from three academic publications (sub-corpora), namely:	461,787
(Sub-corpus: E&S)	Special Feature: Programme on Ecosystem Change and Society: Knowledge for sustainable stewardship of social–ecological systems. *Ecology and society*. 2017	236,847
(Sub-corpus: SOP)	Special Collection: Sense of Place in SES. *Sustainability Science*. 2019	109,593
(Sub-corpus: PS)	Special Edition: Exploring the Transformative Capacity of Place-Shaping Practices. *Sustainability Science*. 2020	115,347

qualitative and subjective process (Baker 2006; Mautner 2019). Our research is thus exploratory, and in the face of limited repeatability, CADS instead encourages transparency (Baker 2006, pp. 178–179; Baker and McEnery 2015, pp. 8–9).

This section will provide an overview of our approach, and our paper is accompanied by extensive information in the electronic supplementary material (ESM) for readers who wish to trace specific points of analysis, or deepen their understanding of CADS. A specific discussion of experience with CADS and its limitations and opportunities is discussed in "Critical reflections on CADS and its prospects for sustainability research".

To undertake our research, we combined data from an automatically built web corpora with manually selected texts (Wild et al. 2013). To analyse this data, we integrated the quantitative capacity of corpus linguistic tools with qualitative analysis and interpretation (e.g. Grundmann and Krishnamurthy 2010; Leedham et al. 2020). Managing the size of our dataset let us combine (and surface) insights that were visible from quantitative tools, and compare these to qualitative reading of the texts. In addition, using automatically collected web data helped to validate our choice of hand-selected texts. Despite these positives, there are inherent limitations to these choices and decisions, which are included in the text below.

Corpus construction

Table 1 summarises the datasets used in our study. More detailed narrative descriptions of their construction and analysis are provided below.

The public corpus (PC): an automatically compiled corpus to identify prominent users and usage of "place-based", "sustainability", and "change" on the English Internet

The first phase of the research sought to sample prominent sites addressing the topic of place-based sustainability on the English Internet. We used Sketch Engine's integrated WebBootCaT tool (Baroni et al. 2006) as it is an established resource for automatically building web-derived corpora for corpus linguistic research. The Internet has been described as a "cheerful anarchy" (Sinclair 2005 in Gatto 2014, p. 79) and one challenge from its use in research is that proprietary search algorithms influence and mediate our access, making the identification of "prominent" and "relevant" sites a vexed and unresolved issue for researchers (Gatto 2014). WebBootCaT helps to (somewhat) overcome this by sending web queries to the search engine Bing from an independent server, reducing the influence of the researcher's location and search history on results.[2] The tool captures metadata, extracts text, and semantically tags that text to create files in a corpus ready for analysis with Sketch Engine's analytical software (Kilgarriff et al. 2004; Wild et al. 2013).

A design feature of WebBootCaT is that it sends all possible three-term combinations selected by the user to the search engine Bing. Choosing search terms is an inherently contestable decision that reflects the subjective judgement of the researcher. Through iterative testing, we selected the search terms *place-based, sustainability,* and *change*. We found "sustainability" and "change" were encompassing terms relating to the central goals of STT, whilst "place-based" helped to narrow the results to relevant material. "Place-based" is also a term that we found consistently used in the various disciplines of interest, from sustainability to urban planning (e.g. MacGillivray and Franklin 2015; Chase

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[2] How exactly Bing determines which sites are most relevant based on the search terms provided is not publicly available.

2017; Norström et al. 2022; Tomaney 2010). Using more than three terms was avoided, as it would complicate the web-building process and reduce the specificity of the dataset to the research question (Wild et al. 2013). While other terms are clearly relevant, this specific set of three offered the closest alignment with the research questions.

WebBootCat's default of extracting data from the top 30 web addresses (URLs) was used to manage the size of the corpus so that qualitative analysis of the resulting dataset remained feasible. In line with norms for this type of analysis, raw data was reviewed to remove duplicate material (three URLs removed), address failures in data retrieval (three URLs were unreadable), and to screen for ethical concerns (one URL removed) (see S1 in the ESM for a flow chart summarising exclusions). The final public corpus comprised 23 documents (170,189 words) containing the extracted text from web addresses that Bing identified as the most relevant online sites using the terms place-based, change and sustainability.

The academic corpus (AC): a manually constructed specialist corpus

Analysis of the public corpus indicated that academics in the field of STT were the largest group of authors in the extracted documents, suggesting to us they are key proponents of place-based sustainability. While this finding reiterated the validity of undertaking this research, it also highlighted the opportunity for a second stage in the research process. This second stage sought to gain detailed insights into discourse(s) within the field of STT. To create the academic corpus (AC), we collated three special feature publications that were (in 2019) recent publications of prominent peer reviewed academic journals that promoted the discussion of place-related concepts in the STT field (Table 1) and cover a range of ways that place is being considered and framed in relation to STT. Doing so thus helped to complement what could be explored through the PC construction and analysis. The sample was identified through the researchers' familiarity with the field and a narrative literature review conducted in 2018–2019 as part of a doctoral research project studying sustainability transitions and transformations in relation to social and ecological dimensions of place. The data sample is focused is on environmental and social science contributions within STT, where we saw an interest in place most clearly emerging at that time. A special feature from *Ecology and Society* (the E&S sub-corpus) communicated research from the Program on Ecosystem Change and Society (PECS), a large international research initiative focused on what it describes as place-based social-ecological research (PBSER) (Balvanera et al.

2017). Some papers from this publication were also captured in the public corpus, further supporting its relevance. Two special feature publications from *Sustainability Science* were included: (i) a special feature that connected sense of place (SOP) studies to STT theory and research priorities (the SOP sub-corpus) (Masterson et al. 2019) and (ii) a special feature on place-shaping (the PS sub-corpus) which shared findings and perspectives from projects in the European SUSPLACE programme (Horlings et al. 2020b). While there are various ways this stage of the research could be done, our qualitative knowledge of the field influenced these decisions, and maintained the balance between a large dataset, and a qualitatively manageable one.

Moreover, part of the motivation for the research was that we suspected both obvious and subtle differences in how author groups amongst these publications were engaging with the topic of place, and its role in pursuing change. We sought to test the value of CADS methodology for identifying those differences. Combining an automatically constructed PC and manually selected AC allowed comparison of these two methods of sampling.

Data analysis

We used Sketch Engine to analyse keyterms and collocates (defined in Table 2) to identify linguistic patterns. These analyses were complemented by qualitative reading of the text, inductive coding to identify thematic categories, and comparisons of the results. This process demonstrates the inherently qualitative nature of CADS research and analysis, despite drawing on a quantitatively informed view of language.

The combination of these approaches was iterative. For example, initial analysis of the public corpus explored authorship, keyterms, and concordance. As qualitative familiarity with texts grew, documents were grouped into thematic sub-corpora. Keyterm analyses were then repeated at the sub-corpora level and compared to test the validity of the thematic groupings. This iterative and cyclical approach is common in corpus-assisted sociological research (Baker 2006), and reflects, more broadly, what Sanscartier (2018) described as the 'craft' of mixed-methods research.

Corpus tools thus provided a quantitative understanding of language within texts which supported a qualitative process of interpreting the texts and their use of language; the results outline how patterns of meaning were identified at the level of specific terms, documents, and groups of documents, all of which are recorded, for transparency, in the ESM.

Table 2 Analytical techniques used in the study

Analytical technique or focus	General definition and use	Application in the research
Keyterms	Keyterms are words or phrases identified as salient features of a corpus. Salience is informed by calculating the relative frequency of a linguistic feature in a focus corpus compared to a reference corpus (Kilgarriff et al. 2014) Insights into the 'aboutness' of a corpus can often be identified by comparing a focus corpus to a general language reference corpus (the RC) to generate salient keyterms (Baker 2006; Scott 1999)	Sketch Engine was used to generate lists of candidate keyterms with high salience scores. These were reviewed to consider dispersal across documents, raw frequencies, and the context of their use in the text (i.e. their 'concordance lines') We scanned all candidate keyterms for themes and detail the review process in the results The outputs of keyterm analysis are summarised in figures and tables in the main text with full details provided in ESM (S5, S6). Key insights and themes are detailed as results
Collocates	Collocates are words used before or after (i.e. alongside) a focal term Collocate analysis often uncovers patterns in how topics or concepts of interest are framed and discussed, providing qualitative insights into attitudes or perspectives in the text (Baker 2006; Stubbs 2001)	Sketch Engine's 'Wordsketch' tool provided a snapshot of collocates for selected search terms. Wordsketch outlines how the term appears in various grammatical contexts (e.g. words that frequently appear as the search term's subject or object, etc.) 'Keyness' measures of collocate relationships provide statistical context to observed patterns. Our paper highlights the most insightful outcomes; full results are available as ESM (S4, S8)
Comparisons	In general, comparison is a fundamental and ubiquitous element of corpus linguistic techniques (including keyterm and collocate analysis)	To complement insights about what texts highlighted (via keyterms), and how topics were framed (via collocates), two comparisons were used: Direct comparisons between the PC and AC produced keyterm lists that helped identify comparative differences in focus and attention To explore similarities, we compared keyterm lists (from comparisons to the RC) between corpora; shared keyterms provided linguistic evidence that certain themes and topics were shared by different groups of texts

We drew on Baker (2006) across all aspects; Egbert and Biber (2019), Gabrielatos (2018), Kilgarriff et al. (2014), and Scott (1999) for pertinent discussion of keyterm analysis; Stubbs (2001) for a discussion of collocates; and Feola and Jaworska (2019) in our approach to shared keyterm analysis

Explanation of statistical measures and reporting style

This study used statistical tests built into the Sketch Engine tool; keyness analysis used Kilgarriff's (2009) Simple Maths technique, with an N score of 1. For collocate analysis, a logDice of 7 was used as a cutoff point to assess statistical significance, in line with norms and previous studies (Kilgarriff et al. 2014). All terms mentioned have a p value < 0.0001. Whilst an explanation of these decisions is beyond the scope of this paper, they represent very common standards for corpus-assisted research (e.g. Feola and Jaworska 2019).

Whilst offering many methodological benefits for this study, Sketch Engine has known limitations in the statistics that can be used and reported. In addition, there is ongoing discussion in Corpus Linguistics about which statistical tests are best suited to assessing keyness (Gabrielatos 2018). In recognition of this context, we undertook sensitivity tests to explore the results using alternative statistical measures and methodologies. The outcomes of these tests supported the statistical validity of keyterms found via Sketch Engine and test results are provided in the ESM for transparency and to support future methodological research on these topics (S4).

Finally, communicating analyses of keyterms, collocates, and other comparisons can be jarring for unfamiliar audiences; extensive tables and statistics can become taxing to read whilst presenting an aesthetic that masks qualitative considerations in their production and the interpretive analysis they support (Mautner 2019; Baker and McEnery 2015). In this paper, we approach our reporting conscious of a broad readership. The main text of our paper focuses on the most insightful findings from these various analytical techniques and we use illustrative figures to communicate our results. To ensure transparency, we have complemented our text with summary tables in the ESM and full results in an online repository (Baker 2006, pp. 178–179). Doing so lets us surface key insights through a narrative description in each section of the results, assisting the reader to understand the 'evidence' alongside our interpretations and findings.

In line with methodological norms, terms from the corpus are presented in fixed-width font and excerpts (quotes) from the corpora are presented verbatim and numbered, with emphases retained where relevant. References to individual texts in the PC corpora are indicated with square parentheses and a table (S2) is provided in ESM listing those sources. Texts from the AC corpus are referenced in text and listed in the ESM (S3).

Results: sketching the discursive landscape of place-based sustainability

Our results are presented in three parts. First, we describe the thematic groups identified in the public corpus (3.1) and academic corpus (3.2). The final section (3.3) discusses overlaps between thematic groups and provides qualitative synthesis of the discursive landscape.

A summary of the discursive landscape, based on our analysis of keyterms, is presented in Fig. 1 and referenced throughout the results.

Prominent voices and perspectives about "place-based" + "change" + "sustainability" on the English Internet

The public corpus is a sample of websites discussing place-based, change, and sustainability on the English Internet judged to be the most relevant at the time of research by the search engine Bing. The iterative exploration of its content culminated in manually coding each document based on dominant themes, information about its authors, and document type (Fig. 2).

Three themes were identified: a place-based sustainability education theme, a community wellbeing and development theme, and a sustainability science and practice theme. These groups were analysed as sub-corpora and the results are outlined below.

Theme 1: place-based sustainability education

SUMMARY: This group of documents presented "place" as a forum and a theme through which people can learn about sustainability dilemmas, develop biophilia, and pursue re-inhabitation.

A place-based sustainability education theme was identified in documents from general reference websites [#23], civil service organisations [#14, #15], the New Zealand Ministry of Education [#19], and academic papers discussing education pedagogy and practices globally as well as in specific contexts of North America and Australia [#1, #7, #8, #9, #10] (Fig. 1). The most frequent and salient keyterms, `place-based education` and `place-based learning`, were often used as proper nouns and frequently as headings or categories under which more specific concepts were elaborated.

Keyterm lists (with illustrative results in Fig. 1 and Table 3) pointed to specific educational contexts, movements, and practices that place-based education and learning engages with or entails. Detailed review showed that references to terms such as `education for sustainability` reflect the influence of Australian and New
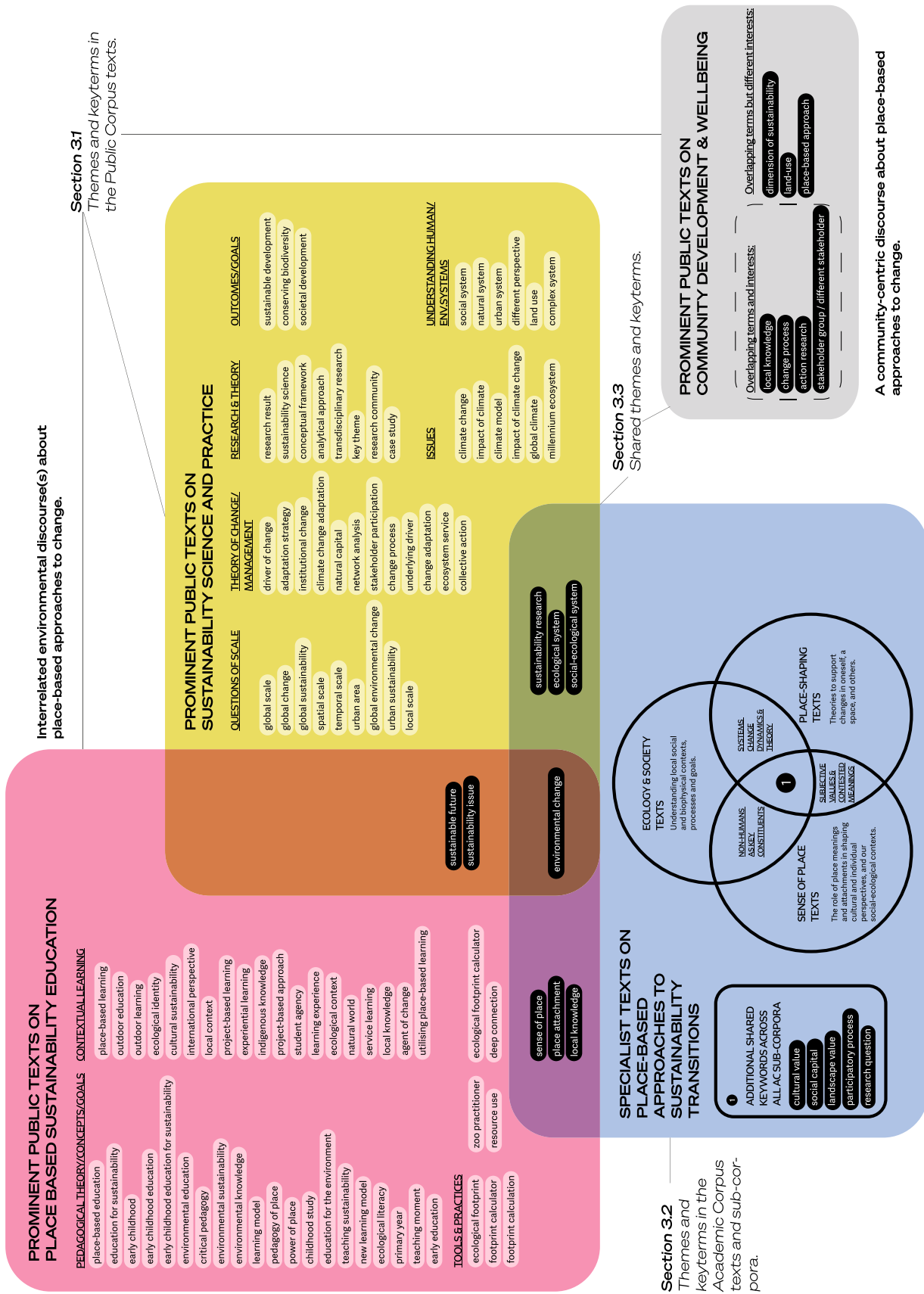
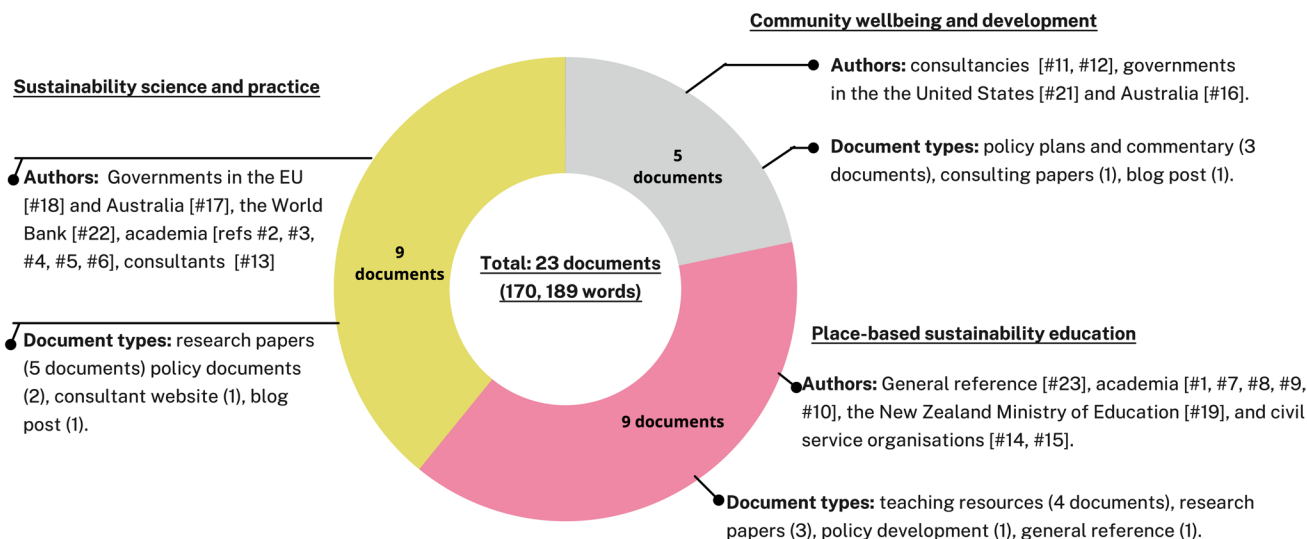**Fig. 1** An overview of the discursive landscape identified through keyterm and thematic analysis

Community wellbeing and development

Sustainability science and practice

Authors: Governments in the EU [#18] and Australia [#17], the World Bank [#22], academia [refs #2, #3, #4, #5, #6], consultants [#13]

Authors: consultancies [#11, #12], governments in the the United States [#21] and Australia [#16].

Document types: policy plans and commentary (3 documents), consulting papers (1), blog post (1).

Total: 23 documents (170, 189 words)

9 documents

5 documents

9 documents

Document types: research papers (5 documents) policy documents (2), consultant website (1), blog post (1).

Place-based sustainability education

Authors: General reference [#23], academia [#1, #7, #8, #9, #10], the New Zealand Ministry of Education [#19], and civil service organisations [#14, #15].

Document types: teaching resources (4 documents), research papers (3), policy development (1), general reference (1).

Fig. 2 Prominent author groups and themes identified in the public corpus after data cleaning

Table 3 Top 20 keyterms from the PC texts, grouped by themes

No.	Place-based sustainability education	Sustainability science and practice[a]	Community development and wellbeing
1	Place-based education	Sustainability research	Place-based approach
2	Place-based learning	Social–ecological system	Based approach
3	Education for sustainability	Sustainability science	Neighbourhood renewal
4	Ecological footprint	Ecosystem service	Theory of change
5	Outdoor education	Global sustainability	Indicator system
6	Early childhood	Global environmental change	Local stakeholder
7	Early childhood education	Environmental change	Community change
8	Outdoor learning	Sustainable development	Area-based initiative
9	Early childhood education for sustainability	Global change	Place-based initiative
10	Environmental education	Conceptual framework	Low-income community
11	Ecological identity	Urban sustainability	Place-based working
12	Footprint calculator	Analytical approach	Strategy for neighbourhood renewal
13	Critical pedagogy	Collective action	Strategy for neighbourhood
14	Footprint calculation	Urban system	Community of color
15	Environmental sustainability	Institutional change	Sustainability indicator
16	Zoo practitioner	Local scale	Community engagement
17	Resource use	Millennium ecosystem	Previous approach
18	Environmental knowledge	Transdisciplinary research	Limitation of place-based approaches
19	Learning model	Ecological system	Demonstrating impact
20	Pedagogy of place	Land use	Community development

[a]Keyterms in the sustainability science and practice texts have been filtered to only include texts in more than two documents. Full lists are available in S4 and S5 in the ESM

Zealand authorship in the documents, where such terminology is locally preferred to what is elsewhere called Education for Sustainable Development (UNESCO 2014). Other terms identify more specific pedagogical strategies and tools used in practice; `ecological footprint` is a popular tool to help individuals connect personal habits to global environmental impacts (GFN 2022), which many educators see as a valuable pedagogical practice (UNESCO 2016). Meanwhile, terms such as `outdoor education` and `outdoor learning` point to a preference for experiential learning approaches that directly engage with nature in outdoor settings; and `early childhood education`,

`critical pedagogy` and `environmental sustainability` show that place-based education includes critical engagement with environmental issues, and suggests a focus on younger age groups in the PC.

Statistically salient, but less frequent keyterms included references to specific and established concepts in environmental literature such as `sense of place` and `place attachment` (see Masterson et al. 2017) and `ecological literacy` (see Orr 1992, 2004) alongside terms that might be considered as signposts of specific teaching practices and priorities for place-based sustainability education: `student agency`, `project-based approach`, `Indigenous knowledge`, `local knowledge`, `teaching moment`, `deep connection`, and `experiential learning`. Topics of interest were also indicated by infrequent keyterms, including `cultural sustainability`, `environmental knowledge`, `ecological context`, and `sustainability issue`. Overall, these terms reiterate a pervasive focus that was identified from qualitative reading of the documents: a pedagogical strategy of contextualised engagement with a local socio-ecological setting and the sustainability dilemmas therein.

There appears to be a relatively coherent conceptual hierarchy in term use: a more frequent (and salient) use of general terms followed by more specific (but less frequent) topics, tools, and considerations in place-based sustainability education. This indicates that the authors of these texts have a shared understanding of what place-based education and learning comprise, and how such education contributes to sustainability (i.e. a shared sense of the curriculum). However, authors advocate diverse pedagogical strategies to deliver on this curriculum. More broadly, our analysis suggests that, amongst discussions of *place-based*, *sustainability*, and *change* on the English Internet, there is a prominent discourse about the role of place in sustainability education that offers ideas and practices to support individual and societal change through learning.

Theme 2: community development and wellbeing

SUMMARY: In this group of documents "place-based change" appeared synonymous with community-based change and "place" was a means by which to group contemporary human communities.

A smaller group of documents in the PC shared a thematic focus on public health and community development. These documents included consultant reports from the USA [#12] and the UK [#11], and government documents from the USA [#20, #21] and Australia [#16, #17] (Fig. 1).

The most salient keywords in this sub-corpus (Table 3) were about local human communities and issues of equity and wellbeing; `neighbourhood renewal`, `local stakeholder`, `community change`, `area-based initiative`, `low-income community`, and `community engagement`. This focus was made explicit in some document headings:

(1) "8 policies that have contributed to place-based health disparities across generations" [#12]
(2) "The Role of Place-Based Initiatives in Community Development" [#20].

In other documents [e.g. #16, #11, #12], detailed qualitative review was required to understand their inclusion. For example, one document [#12] made 11 references to `sustainability` and used terms such as `ecosystem`, `landscape` and `environment`, but all terms were used as metaphors for human systems and topics. Another document [#16] referenced the concept of `place attachment`, but measured this as access to a community centre, an exclusively social interpretation of the concept (see Tuan 1977; Cresswell 2004/2015).

Overall, this group of documents indicated a discourse about place and change that is prominent on the English Internet and largely unrelated to topics of environmental sustainability, despite using shared words.

Theme 3: sustainability science and practice

SUMMARY: This group of documents used "place" as a frame to discuss social–ecological systems. It was closely linked to the field of STT research and practice.

The third group of documents included online reports, articles and webpages from private sector, government and academic authors (Fig. 2) that discussed theories and practices in pursuit of transformative system change for sustainable futures. Some documents had a central focus on place-related topics, whilst others addressed a much broader agenda. For example, one large document [#18] compiled the views of prominent academics into a summary of the STT research field; `place` was prominent enough to prompt the document's inclusion in the corpus building process, but it was one of many conceptual perspectives raised. On the other hand, a smaller document [#17] from the Victorian Government in Australia, deliberately and specifically used place to frame topics in environmental sustainability. Other documents included material from consultancies and academic papers, including two documents from the Programme on Ecosystem Change and Society (PECS), a large international research project that was independently identified and manually selected for inclusion in the academic corpus.

The initial analysis of keyterm lists for this sub-corpus identified few insights that were specific to place-based sustainability. The most salient terms (Table 3) include general names for the discipline (`sustainability science`, `sustainability research`) and proper nouns that are prominent terms and concepts in STT scholarship. One document [#18] in particular contributed to this observation, as its frequent use of jargon introduced many distinct but non-place-specific terms.

To go deeper, keyterm analysis was repeated with results filtered to only include terms used in three or more documents. 51 keyterms met this criterion. Qualitative review of these terms identified six thematic categories, shown in Fig. 1 (scores in S5). Taken as a group, the categories describe a discourse of sustainability wherein places are often considered as `social-ecological systems`[3]; spaces with more-than-human constituents that serve as forums for `place-based research` to investigate `complex`, situated `changes` which occur in `systems` at various spatial and temporal `scales`.

Overall, analysis of the PC indicated that prominent discussions of *place-based, change* and *sustainability* on the English Internet include three types of discourse about place-based change. One focuses solely on Community Development and Wellbeing and the other two incorporate environmental themes in different ways. Academic, policy, and civil society authors were the main authors of the material, and were present in each thematic group. While not the primary focus of our research, geographic analysis showed that Australia and North America appeared in each thematic group, suggesting they may be sites where these thematic discourses interact.

Academic discourses about place-based change in our sample of STT texts

In analysis of the academic corpus, the most insightful results came from reviewing the contextualised use of the 100 most salient keyterms of each sub-corpora. Thematic coding of these terms identified the overarching points of focus in each publication (Fig. 1). While collocate analysis was conducted for a variety of terms, *change* provided the most insightful results. Collocate analysis of the term *change* consistently drew forth deeper sentiments that we observed from qualitatively reading the texts; namely,

whether change was presented as something that is good, bad, or complicated.[4]

The sections below describe the themes and perspectives in each sub-corpora drawing on keyterm, collocate, and qualitative analysis.

Stewarding ecology: an ecologically grounded viewpoint

The E&S corpus comprises findings from a global research programme (the Programme on Ecosystem Change and Society—PECS) that began more than a decade ago (Carpenter et al. 2012) and has become a prominent influence in SES research, and sustainability science more broadly (Norström et al. 2022). In our dataset, Norström et al.'s (2017) editorial gives an indication of PECS interaction with topics of place and change, recounting an agenda to support a network of contextual SES research that can enable learning within and across these experiences and scales. Hosted in the Stockholm Resilience Centre, PECS describes its vision for a "world wherein human actors are transformed to achieve sustainable stewardship of social–ecological systems" (Norström et al. 2017).

Corpus-assisted review helped to elaborate and explore the tendencies that sit within the texts. Analysis of keyterms, alongside qualitative review, showed that the E&S sub-corpus placed particular emphasis on efforts to understand `ecological` processes and dynamics in the natural world, alongside efforts to support the human management of these spaces, dynamics, and agendas. Some terms and concepts (`human wellbeing` and `ecosystem services`) highlight human needs and position humanity as the managers of other species. Other terms, like `stewardship`, reflected that this position isn't taken blindly; keyterm analysis and qualitative review gave the overall impression that this sub-corpus frames place-based sustainability with a normative agenda to manage for the needs and wellbeing of non-humans, as well as humans. Pragmatic tools like concepts of `elasticity` and `ecosystem services` were frequently discussed constructs to help actualise these goals.

Collocate analysis of `place-based` showed that the texts often referred to places as `social-ecological systems`. In this framing, places are ontological realms with more-than-human material considerations and priorities; things like `erosion` and `landscape structure` become important topics to be considered. Compared to the other AC sub-corpora, the E&S documents were less focused on interior (and abstract) values and meanings that are contested in communities and that influence dynamics of power, and the directionality of change.

Collocate analysis of `change` showed that texts in the E&S sub-corpus discussed `change` as `climate change`, `ecosystem change`, `land-use change`,

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[3] One text in this group of documents favoured the expression 'socio-ecological systems', but its usage appeared synonymous with the 'social–ecological systems' concept used in academia.

[4] Collocate analyses of the terms *place-based* and *sustainability* reiterated the 'aboutness' of the sub-corpora, but keyterm analysis offered more depth. See S4 for those analyses. Visualisations of the wordsketches for collocates of 'change' are provided in S8.

and other terms describing humanity's major impacts on Earth. It also highlighted a pragmatic attitude: changes were `related`, `required`, and they simply `are` part of reality. We can `moderate` change, `manage` it, `address` it, or `undergo` it. We can seek to `study` it, `understand` it, and use that knowledge to `manage social-ecological systems`.

Sense of place: a contested viewpoint

The SOP sub-corpus presented a situated discussion of place by focusing on specific (and named) locations rather than abstract concepts. In this way, the SOP corpus understood place similarly to the E&S texts; place-based sustainability is a physical endeavour that occurs in specific `social-ecological systems`. Despite this situatedness, some of the salient terms in the SOP corpus suggest interest in studying local phenomena in connection with broader systems over space and time. For example, `biocultural diversity` refers to Maffi's (2001) systemic sensibility that acknowledges the pattern of interconnectivities between location, language, and culture in shaping humanity's relationship to nature in social–ecological systems. Other terms, like `ecological grief`, reflect a temporal dynamic and the consideration of historical events, whilst `traditional authority` reflect an interest in comparative and coexisting cultural dynamics. The SOP sub-corpus included salient references to established concepts such as `place attachment`, `place-meaning`, and `place identity` which all concern the contested and constructed meanings and values which mediate our relationship to local landscapes (Masterson et al. 2017, 2019; Tuan 1977). Collocate analysis of the term `place-based` reiterated this agenda, highlighting `cognition` as its most frequently modified noun. A suite of individually infrequent but thematically linked nouns showed `place-based` was often linked to discussions of `risks`, `behaviours`, `experiences`, and `management`, further reflecting the topical interest of SOP research.

The SOP editorial by Masterson et al. (2019) provides context to these patterns. Building on earlier efforts to connect concepts in place to the theories and priorities in STT (Masterson et al. 2017; Stedman 2016), publications in the corpus provide a set of case studies and case study comparisons (e.g. Verbrugge et al. 2019). Collectively, they draw attention to place politics, asking whose place meanings take hold, and with cases at different scales, they ask how complex and inter-scalar dynamics connect the social and the biophysical sides of place. To inform practitioners, papers touched on the (positive and negative) transformative potential held in place meanings and place attachment, with Masterson et al. (2019, p. 557) summarising the opportunity

as "scaling up stewardship behaviour from the individual to the global".

Collocate analysis of `change` reflected the nuance that an awareness of contested place meanings can surface. This identified a shared perspective in the documents that framed place-based sustainability as an engagement with dilemmas, rather than adopting a more normative or problem-solving stance. In the SOP sub-corpora, `change` was shown to have both `ecological` and `self-perceived` dimensions. It happens `globally` and in specific `places` and `landscapes`. Important dynamics of change included `decision-making`, `adaptation`, and the role of `participants`, `impacts`, `narratives`, `attitudes`, and (`contested`) `meanings`. Across the SOP sub-corpus, change was presented as a complicated phenomenon; it is something we `withstand`, `navigate`, `mitigate`, `plan`, `accept`, `undergo`, `arrest`, `witness`, and/or `make`.

Overall, the SOP perspective identifies complex social–ecological dynamics that should be considered with `reflexivity` to the subjective human experiences and dilemmas that accompany specific changes in specific contexts. Whilst there is an interest and awareness of temporal, spatial and inter-cultural connections, it is a systems-conscious posture that appears to emphasise differences, rather than similarities, across those nested and interdependent relationships. In this way, the SOP sub-corpus presents a sensibility toward place-based sustainability that envisions or suggests a diverse system of locally nuanced expressions, rather than the spread and localisation of a globally shared approach or agenda.

Place-shaping: an interior, pro-change viewpoint

The PS sub-corpus had prominent focus on `agency` and presented change as a force for good. Salient keywords such as `regenerative`, `compassion`, `decentral*`, and `transgressive` describe how that change is (or ought to be) undertaken, and towards what ends.

Collocate analysis of the term `change` reiterates this perspective. `Change` (as an object) is something to `drive`, `make`, `enforce`, `induce`, affect, `embrace`, and `require`. It is done by change `agents`, in ways that are `transformative`, `inner`, `societal`, `radical`, and `tangible`.

Qualitative reading identified two different types of change in the publications: (i) a development view on how people can (physically) change spaces for `development` or `regeneration` and (ii) how people change themselves or each other through `transformative learning`, adapting Mezirow's (1993) theory about interior change in adults. Compared to the SOP and E&S sub-corpora, the PS corpora displayed a more positive stance on change and

a more abstract framing of place. Place was framed as a general concept, and place-based change was presented as a generalisable, translocatable process, rather than something situated in specific social and ecological features of specific locations. Similarly, keyterm lists indicated that specific environmental features were not salient topics of discussion and there was instead an emphasis on community participation and co-creation. For example, Soares da Silva and Horlings (2020, p. 364) defined sustainable place shaping as "the capacity of citizens to develop sustainable practices that shape their living environment according to their own ideas, needs, values, and demands" whilst Horlings et al.'s (2020b) editorial synthesis of the PS publication summarised that places were framed as "virtual arenas", "a state of mind", "narrative", "imagined", and as "a stage" for Transformative Learning. In other words, place is a topic of interest due to its epistemological and social relevance to humans. Whilst this was the most salient and differentiating perspective identified in the sub-corpus texts, environmental concerns were also present, albeit discussed in abstract and implicit terms like `regenerative action` and `ecological consciousness` (see Horlings et al. 2020a, b; Mehmood et al. 2020; Pisters et al. 2019; Rebelo et al. 2020). Compared to the PS and SOP sub-corpora, the PS discourse was more abstract and contained less critical discussion on where, how, and if the rights, interests, and conditions of non-human stakeholders specific to a location are considered in the process and axiology of change.

Shared keyterms in the AC sub-corpora show overlapping priorities

Moving beyond the nuanced differences in the AC sub-corpora, the texts were also analysed for similarities. Twelve keyterms were shared across the sub-corpora (S7). The most obvious theme in the shared keyterms is an academic preference to describe places as hybrid social–ecological systems, reflecting a specific lineage in STT scholarship (e.g. Berkes and Folke 1998; Folke 2006). Other shared keyterms signal that in a context of environmental change, priority topics include participation, local knowledge and the emotional and cultural ways we define, value, and relate to places and their non-human constituents.

Pairs of sub-corpora were also explored. A total of 100 keyterms were shared between different pairs of sub-corpora (listed in S7). Reviewing these shared keyterms showed (i) a shared emphasis on non-humans amongst the E&S and SOP sub-corpora, (ii) a shared emphasis on societal and systems change research amongst E&S and PS sub-corpora, and (iii) a shared emphasis on meaning amongst the SOP and PS sub-corpora. In sum, corpus-assisted analysis of the AC texts reveals diverse emphases, from an ontological focus on specific places and changes in socio-ecological contexts, through to a more epistemological focus on abstract conceptualisations of generalisable place-related theory applied to interior change in humans.

Considering the context of creation and authorship provides two insights that might explain why the SOP and E&S corpora both appear to emphasise place as a contested and more-than-human forum, whereas the PS corpus seemed more positive about the need for human agency. First, the SOP and E&S are connected through the global PECS program. Reflecting on PECS was the focus of the E&S publication, while a note in SOP's editorial voiced that the authors' experiences on case studies within the global PECS program inspired the creation of a special feature on SOP (Masterson et al. 2019, p. 557). The PECS program has a focus on generating scientific and policy-relevant knowledge of social–ecological dynamics needed to enable transformations. This positioning appears less focused on transformation per se and more on providing empirical knowledge that can inform transformation. In contrast, the PS corpus is based on the EU-funded SUSPLACE collaborative programme that aimed to explore the transformative capacity of sustainable place-shaping practices. This programme is founded on an assumption that humans can be agents of transformative change and actively seek transformation, explaining the sentiments that came through in the analysis.

Second, both the SOP and E&S publications had ties to the Stockholm Resilience Centre (Masterson et al. 2019; Norström et al. 2017), a notable influence in SES research with a lineage of authors and terminology that have fed into the field of STT. Whilst we did not do a bibliometric analysis that could deepen these considerations (which would require its own research agenda, and a paper to discuss), we suggest that these contextual influences are likely to sit beneath the data and the patterns we've outlined-shaping networks of dialogue that produce similarities and differences in the terms, ideas, and authorship that were present.

Zooming out: comparing the public (PC) and academic (AC) discussions of place-based sustainability for similarities, synergies, and productive differences

Prior sections outlined the groups of authors, themes, and perspectives present in the PC and AC. This section compares those datasets, focusing on discourses that include an environmental dimension to place-based sustainability and change.
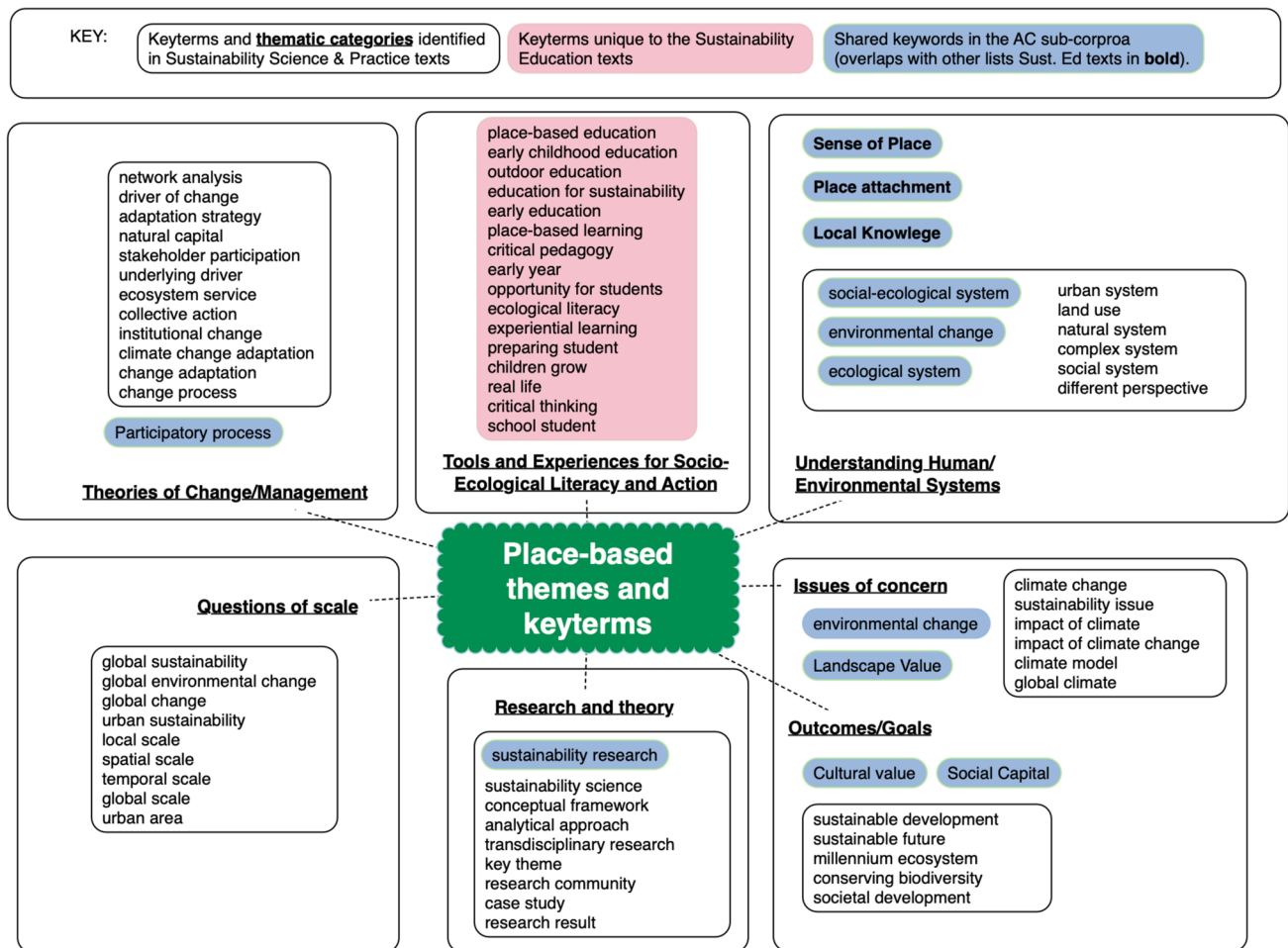
Fig. 3 Central priorities in the environmental discourse about place-based sustainability based on themes identified in keyterms across the PC and AC corpora. Community Development and Wellbeing texts in the PC corpora are omitted to focus on environmentally oriented perspectives

Comparisons between corpora show shared terms, but different agendas between community and environmental discourses, and nuances amongst proponents of an environmental place-based frame

Returning to Fig. 1, our analysis also looked at shared keyterms between each thematic group of texts shown by the black shaded terms. Observing similarities in language helped to deepen and reinforce thematic observations made through qualitative reading. Texts from Sustainability Education texts, Sustainability Science and Practice texts and the specialist texts in the Academic Corpora all referred to an interrelated set of environmental discourses about place-based approaches to change. A separate discourse, meanwhile, was evident in public texts focusing on Community Development and Wellbeing; these presented "place" and "place-based approaches" as a human-centric agenda.

Despite these differences, there were shared keyterms between the community and environmental discourses. Both groups paid attention to `local knowledge`, and recognised that within local contexts, there are `different stakeholders` to consider. Other shared references to `land-use`, `dimension of sustainability`, and `place-based approaches` reflect our previous observation that a community-oriented discourse about place within our PC dataset showed apparent ecological interest which, upon qualitative reading, proved to be misleading. Those engaged in a community-based discourse about place were not focused on what kinds of land use might be best for local ecology, but rather a discussion of community-centric change towards locally defined outcomes. The environmental discourse(s), meanwhile, includes inherent attention and affordance to non-humans, including plants, animals, and landscapes as constituents of place and agents in discussions about land use and sustainable futures.

Amongst proponents of an environmental frame for place-based change, one keyterm is shared: `environmental change`. This shows clearly the core agenda of these texts. More interestingly, nuanced emphases become visible by considering the overlaps between pairs of texts: shared keyterms in educational and AC texts emphasise subjective relationships to place; shared keyterms between the public sustainability and educational texts pragmatically focus on issues and the future; and shared keyterms between the sustainability science texts and the AC corpora emphasise systems perspectives and research. Collectively, they are consistent with a focus in the STT literature on a hybrid interpretation of place as a social–ecological system and address the contestations and dilemmas that our emotional and cultural relationship to a place and the context of contemporary sustainability challenges bring forth.

Qualitative synthesis: an opportunity for fruitful exchange about the use of educational tools and experiences

Whilst quantitative analyses were useful, Fig. 3 shows a final step in our analysis: a qualitative engagement with the findings to explore synergies and differences between the environmentally-focused approach to place in the PC and AC texts. As such, consideration of the Community Development and Wellbeing texts were omitted from this step.

First, we observed that the thematic groups identified in the PC's Sustainability Science and Practice texts (Fig. 1) could provide a useful framework to house the priorities indicated by shared keyterms in the AC. This makes sense conceptually, as the AC texts are manually selected publications specific to place-based STT; it is reasonable to expect that the AC texts should fit into the broader field of sustainability science and practice. We then considered if and how the ideas present in the texts about place-based sustainability education might also fit into this field conceptually. A keyterm comparison to identify (and confirm) which topics were uniquely prevalent in the PC's Sustainability Education texts in comparison to the AC corpus was useful for this process (see S4). It confirmed that in the (mostly non-academic) PC texts, a focus on experiences like `outdoor education` and concepts such as `ecological literacy` and `real life` reflected a more situated and experiential pedagogy. Meanwhile, the AC discourse on learning, which was most prominent in the PS sub-corpus, was thematically more abstract and focused on processes of interior change.

We found that the way place was approached in sustainability education complements the focus in place-based STT literature based on our data sample of these sources. Namely, the public discourse about place-based sustainability education identifies practical tools and pathways to enact sociocultural change in line with the theories and topics raised by the PC and AC sub-corpora. While public texts focused on

children ("Theme 1: place-based sustainability education") and the STT academic focus appears to be on adults ("Place-shaping: an interior, pro-change viewpoint"), we suggest that there is an opportunity for dialogue to reach more deliberately across age groups and activate situated place-based learning as a pathway for change.

The implications of this qualitative synthesis of the data are discussed in more detail in "A shared storyline for a place-based approach to sustainability transitions and transformations".

Discussion and contextualisation of the findings

Our analysis indicated that multiple place-related discourses were present in the texts. However, it also identified shared themes of interest amongst sustainability educators, practitioners, and STT academics.

This section contextualises the findings and discusses what sustainability practitioners and researchers might learn from our study, including areas of uncertainty and caution in the interpretation that is offered. In doing so, it draws forth a discussion of the patterns in the data, and how things appear to have progressed between the time of sampling and publication—a period that has seen the STT field continue to expand, and references to place appear to have grown from a re-emerging interest into a common point of reference.

Competing "place-based" discourses have consequences for people and the places they reside in

A general premise in discourse theory is that coexisting movements that use similar words for different ends are engaged in a discursive struggle to frame and represent the world (e.g. Jørgensen and Phillips 2002). This struggle persists whether we are conscious of it or not. Our study observed two very different discourses about "place-based" approaches to social change and sustainability. A community-focused dialogue talked about place-based change as something pursued for entirely human outcomes; place, here, was a synonym for community. Sustainability educators, practitioners and STT academics, meanwhile, discussed "place" as something much broader: a more-than-human assemblage of constituents with contested rights, identities and narratives that interact and co-exist. This discourse carries an interpretation of sustainability in which contemporary human aspirations are considered alongside affordances to other species, histories, and entangled assemblages of social–ecological systems.

What happens, then, when a person predisposed to using place as a synonym for community hears the call

for 'place-shaping' in the context of a discussion about land use and planning? Will attention to social–ecological hybridity and a concern for eco-justice be salient features of what is produced—or might 'place-shaping' simply be (re)interpreted as an invitation for local people to express their agency and adapt their landscape to their own wishes and aspirations? In public planning contexts, 'place-making', for example, has been widely interpreted and acted on as a call for public art, public spaces, and community events. We come away from this study with clarity not just about the discourse present in the field, but about the stakes at hand and consequences that can be carried by competing place-based discourses. This is not to say that the discursive differences we observed have necessarily led to overt discursive struggles. Those who frame place as being about human communities may have no strong objection to inclusion of non-humans in place-based discourse. Indeed, since the time of our analysis, there are already signs emerging in Australia of a discursive shift from place-as-community to place as more-than-human. For example, in public discourse, Melbourne Design Week's 2019 pronouncement of the need to consider "Landscape as Protagonist" (Donse 2020) and the New South Wales Government Architect's (2023) call for a shift from "human-centered to country-centred" approach to planning reflect an ongoing shift in thinking about place in Australia's design and built environment sector. Similarly, in academic discourse, recent writing in STT calls for "prioritising, valuing, maintaining and embracing nature in cities in Australia", while also arguing that it is "paramount to empower communities" (Frantzeskaki et al. 2022). While new research and contemporary data sources would be required to explore such examples in sufficient detail, these examples hint that any potential discursive struggle may be on its way to resolution in favour of recognising the integrated social–ecological dimensions of place. The next section draws on our data to synthesise what that resolution may look like.

A shared storyline for a place-based approach to sustainability transitions and transformations

The publication of this paper is itself a contribution to the discursive landscape about what "place-based" change is, and what it means for sustainable futures. In this context, we want to explicitly describe an approach to place-based sustainability transitions based on what we encountered in the data. By doing so, we do not assert any ownership of the discourse, but draw out what is being pursued, surface its most salient features, and promote a conscious and deliberate engagement between (self-identifying) proponents of a place-based approach to sustainability. This calls for sustainability researchers and practitioners to (continue) an active participation in forming a discourse coalition: a group of

actors that share storylines around an identified set of practices (Hajer 2006); in this case, one that is centred on the case for a place-based approach to sustainability transitions and transformations.

The shared storyline for place-based approaches to STT that we identify in the data (drawing on the synthesis outlined in Fig. 3) includes these key features:

1. Concern with environmental change, including climate change, and a vision for the future that includes biodiversity conservation and societal development.
2. Awareness of multi-scalar change, including interactions between local and global scales, as well as changes within individual people and broader communities.
3. Interest in the system dynamics of institutional, ecological, and social dimensions of change, and the management of this change.
4. Recognition that non-human rights and outcomes matter and that place-related values are contested. This requires consideration of how we develop and shift our emotional connections to nature, engage with locally specific ecological knowledge, and construct the meanings and attachments that shape our sense of place.
5. An approach to change that emphasises collaborative work by and with local communities, based on a foundation of cultural and ecological literacy about that local place. Such collaborative processes can draw on tools and concepts from environmental education and transformative learning, practical measures for assessing and managing local ecosystem services, and the co-creation and contestation of place meanings.

Subsequent sections offer critical reflections about the ideas that are offered and invite proponents of place-based change to engage in reflexive debate and discussion.

Attention to place helps to put more-than-human ethics into practice and the discourse has continued to emerge

A storyline like that outlined above is increasingly evident in contemporary sustainability literature published since the compilation of our data. First, more literature is identifying place as a forum to generate diverse knowledge and more ethics-driven approaches to change (West et al. 2018; Abson et al. 2017; Hakkarainen et al. 2022). Second, there has been a reinvigoration of concepts like biocultural diversity (Maffi 2005; Fernández-Llamazares 2022) and bioregionalism (Hubbard et al. 2023; Wearne et al. 2023), and the expansion of human–nature connections research (HNC) (Ives et al. 2017; Riechers et al. 2021) that positions human relationships to place as a central aspect of socio-cultural transformations towards sustainability. Third, and relatedly, place

is present in some promising examples that 'flip' the directionality of power in sustainability governance from 'top-down' planning to 'bottom-up' emergence, evidenced by movements like the Seeds of a Good Anthropocene project (Bennett et al. 2021) and Nature Futures Framework used in the IPBES program (IPBES) (Pereira et al. 2020). Sitting across these shifts is a (re)centering of the role that values and relationships to nature play in STT and an attraction to see systems change as a plural, contextualised expressions rather the art of codifying and spreading change through top-down planning and best practice (Pereira et al. 2021; Chan et al. 2018; West et al. 2020).

Analysis of our data showed that there is a connection to concepts of stewardship (a shared keyterm, and explicit goal raised in the E&S and SOP sub-corpora) that 'place' seems to draw forth when pursuing STT; however, the SOP texts nuanced this observation (e.g. Enqvist et al. 2019) by showing that a community's sense of place can enable stewardship, or work against it (Chapin and Knapp 2015; Stedman 2016). In short, some practitioners have long felt that a simplistic localisation of democracy is inadequate to creating normative ecological outcomes, but nonetheless remain committed to an ethical approach to change (MacGillivray and Franklin 2015). The 'relational turn' in sustainability is becoming an important feature in environmental literature beyond the STT field that helps to address these concerns and the dilemmas they raise (Stålhammar and Thorén 2019; Gow et al. 2022) by refocusing sustainability's focus on navigating the process of change, not just delivering specific ends. The opportunities of a conscientious adoption of values such as duty, respect, and care towards a more-than-human world are becoming salient in contemporary discourses in many corners of sustainability science (West et al. 2018; Leventon et al. 2021; Drury et al. 2023), and the consequences, politics, and trade-offs that this entails come sharply into focus through scales and processes of place-based STT. As we see it, a place-based approach to STT has become increasingly coupled with an eco-justice vision for sustainability. This dynamic is reflected in our data, and we suggest that it presents evidence that a focus on place has been—and can continue to be—a vehicle for these broader shifts in sustainability to enter into the STT field (e.g. West et al. 2020). With interest in ecological dimensions of sustainability emerging through 'nature positive' priorities in mainstream policy and commercial forums (e.g. TNFD 2023; DPE 2023; CfS 2023), we suspect place-based perspectives may become increasingly useful frames through which STT research and practice can engage.

Future discursive research can make use of CADS to investigate how more-than-human politics are being pursued in specific place-based contexts whilst creating datasets and approaches that can also be used to trace discursive shifts and linkages at larger scales and over time. This complements existing STT interests in global research networks (Norström et al. 2022): inter-place dependence and connectivity (Hull and Liu 2018) and the systemic influence that discourses and meanings play in socio-cultural change (Simoens et al. 2022; Riedy 2020, 2022). One specific opportunity might be to explore discursive references to plants, animals, and landscapes as a way to gain insights into competing place meanings and environmental values (see Langer et al. 2021; Ladle et al. 2019) and to explore if these linguistic signals correlate with dynamics in politics and governance (see Hakkarainen et al. 2022). We suggest that web-derived corpora and CADS provide useful techniques for this agenda.

Critical reflections: questions about power and directionality

CADS research adds opportunities for transparency and reflexivity for discursive research, but it does not escape bias altogether. Critical attention needs to be placed on the observations and the research process. In terms of content, we note that Indigenous cultures are often the 'textbook' examples of integrated social–ecological civilisations (Maffi 2005); however, our corpora did not contain a salient suite of terms relating to Indigenous cultures and perspectives. From a critical perspective, it is important to consider the context of power in the creation of the documents that we studied (Baker 2006): who is visible in discussions of place-based sustainability on the Internet and in the academic community, who is not, and who ought to be? We argue that there is a need for greater deliberation and reflexivity amongst practitioners and researchers about who 'does' place-based change and who writes about it. Instead of asserting knowledge about place as an abstract concept, it is our belief that change makers and researchers have a responsibility to be literate about the heritage of a place, its current constituents, and the contestations and power dynamics therein if they are pursuing deliberate change there. Emphasising cultural and ecological literacy as an important part of place-based sustainability may help to improve the practices undertaken by practitioners and researchers, as well as the programmes they run with local communities. Outside of the corpus, nuanced examples of this approach being pursued are seen in civic movements (AELA n.d.) and academic place-based learning journeys (Wooltorton et al. 2020; Bawaka Country et al. 2015), wherein place becomes the forum for academics and practitioners in STT to learn more about where they are and develop relational mindsets. Sentiments for this kind of activity appear particularly mature in post-colonial contexts where there is a sensitivity to history and the complexities it brings.

It is also worth noting that the most place-based practices pursuing sustainability transitions may be 'so local' that they

use place-specific nomenclature that would be overlooked in our analysis due to its very specificity. Our data revealed complex tensions in the way place-based approaches engage with inter-scalar priorities in STT. Some place-based approaches aligned with MacGillivray's (2015, p. 5) call for a 'relentless focus on context', while for others, the pursuit of place-based change was decontextualised, abstract, and conceptual. These polarities carry with them political, epistemic, and ethical dilemmas and consequences.

We identify similar dynamics in the STT literature about place, scale, and change. Where some discussions focus on synergistic dynamics of trans-place change via innovation networks and translocal diffusion (Loorbach et al. 2020), other efforts in the STT field emphasise a vision for local emergence that enhances difference and plurality (e.g. Scoones et al. 2020; Bennett et al. 2021; Fazey et al. 2020). A focus on place, we argue, continues to hone attention to longstanding tensions in how sustainability researchers engage with questions of power, and relatedly, the topic of universal versus contextual knowledge, highlighting a need for productive and reflexive debate within the STT field about the politics of knowledge and how it is used in change. Many debates on these topics are being explored in STT (e.g. Fazey et al. 2020; Wyborn et al. 2020; Caniglia et al. 2021), but they also have long histories in disciplines like geography, where the politics of knowledge, action, and belonging in an interconnected world have long been considered alongside questions of social justice (Massey 2004; Plumwood 2008) and inter-species justice (Whatmore 2002; Haraway 2016; Sharp et al. 2022), and efforts are being made to see how research might "shift relationships of power away from an (Anglo) human-centred dominance towards a reconceptualisation of a co-emergent world based on intimate more-than-human relationships of responsibility and care" (Bawaka Country et al. 2015, p. 470).

Discursive research can do much to investigate tensions about power and its interaction with place and scale, including through specific discourses associated with place-based sustainability transitions. Making use of the data analysis in this study, those efforts might focus on the movements associated with *bioregionalism* and *biocultural diversity*—terms that were present in the corpora of our study and deliberately engage with the tensions of inter-scalar connectivity. Both concepts have recently seen renewed interest and progressive discussions about their value to STT researchers and practitioners (Hanspach et al. 2020; Hubbard et al. 2023; Wearne et al. 2023). Alternatively, we suggest that a fruitful source of reflection and discussion might be found by discursive research into *imaginaries* of change; identifying whether proponents have an imaginary that is more akin to localisation or one more akin to a patchwork of emergent and divergent change initiatives appears to be a useful point of deliberation and discussion.

Opportunities for fruitful dialogue between education and sustainability transitions literature

Our final observation is that the analysis of our data surfaced an opportunity for the STT community to more explicitly engage and integrate ideas, concepts, and practices used in place-based sustainability education (as indicated in Fig. 3). Concepts like ecological literacy, tools that help connect individual behaviours to global issues, and practices like experiential learning can all help to bridge gaps between action and theory, and between personal and collective change. Moreover, the debates that have shaped these educational pedagogies and practices are also pertinent for review. For example, Orr (1992, 2004) has had a seminal influence on environmental education with his writing about the role of place in sustainability education since the early 1990s, drawing on thinkers from John Dewey to Aldo Leopold. The discipline has also been shaped by debates about whether education should be outcome oriented or emancipatory, and how human aspirations should be positioned against interspecies ethics (see Jickling and Wals 2008; Stevenson et al. 2012; UNESCO 2016, p. 24). These dilemmas and questions are equally relevant to place-based approaches to STT. More practically, while the PC documents had a focus on childhood education and school-age audiences, the need for similar learning processes have been noted across all age groups (Charles et al. 1981; Orr 1992, p. 137; UNESCO 2016).

We suggest that exploring tools for place-based environmental learning and their applicability for adults and community contexts would complement existing efforts in STT to explore transformative learning theory and extend the practical opportunities to support change in place-based contexts (Pisters et al. 2019). Signs of progress on this front are also present in contemporary literature, with place and context central in emerging and ongoing discussions about how to transform knowledge systems in service of more plural forms and pathways towards sustainability (e.g. Fazey et al. 2020; Wyborn et al. 2020; Caniglia et al. 2021; Wearne 2023).

Critical reflections on CADS and its prospects for sustainability research

Our final point of discussion is a critical reflection on using of CADS in this study and what it might offer to discursive research. First, corpus tools and techniques approach offered many benefits, but the work involved a 'messiness' noted by others (e.g. Baker 2006; Mautner 2019). The quality of the corpora required careful attention, software presented limitations in processes and methodology, and the significance attributed to specific terms required detailed qualitative oversight.

Using the Internet as a data source carried benefits, but also unresolved issues. This includes complexities and tensions from its fundamentally dynamic nature, the mediation that occurs by search engines algorithms, and the ethics of studying its content (Gatto 2014).

We note that while corpus tools introduced opportunities to access new sources of data, and interrogate them in novel ways, we chose to limit the scope of our study to keep it qualitatively manageable; the data was limited to a selected body of work, in English, from a specific period of time. These all should be considered as limitations when interpreting our study, as the observations we offer are based on this (limited) sample of data. Despite this, we found CADS useful, and it complemented traditional discursive techniques.

Perhaps most critically, we found writing about CADS much more laborious than using it; useful insights were gained in a matter of weeks whilst writing this paper and carefully preparing the evidence grew into a multi-year project.

Our conclusion is pragmatic: we suggest that corpus tools and techniques offer useful additions to any researcher's belt. With time and awareness, publishing discursive research that adopts CADS as a central feature will become easier, and we identified a range of promising pathways for this research to explore. More broadly however, we suspect a pragmatic and useful opportunity for a much wider group of researchers is simply to experiment with digital tools (like WebBootCat and WordSketches) at the early stages of a project. Here, researchers might complement existing tools like bibliometric analysis, narrative literature reviews, and systematic searches of the academic databases with a (more) systematic approach to linguistic data on the Internet, or in selected texts, and in doing so, expand, deepen and challenge their understanding of the discursive landscape and politics that relate to a topic or group of texts.

Conclusions and pathways forward

Returning to the questions raised in "Introduction", we can make several concluding observations. First, in our limited sample of academic and public discourse at the intersection of *place*, *sustainability* and *change,* we found it dominated by institutional voices—those of academia, various levels of government, and consultancies. They showed an ambition to pursue sustainability through "a relentless focus on context" (MacGillivray 2015, p. 5), but deeper analysis suggests that enacting this focus can sometimes lead to the abstraction of 'context' as a concept, drawing forth (a somewhat ironic) risk that discourses about place could still serve top-down priorities about where change comes from and for whom change is pursued.

Second, our discourse analysis revealed a schism between discourses that use place as a synonym for a human community, and those that refer to place as a more-than-human assemblage of constituents with (contested) rights, identities and narratives that interact and co-exist. The latter discourse included those focused mainly on sustainability transitions and those more interested in education for sustainability.

Third, we made the case that those using place in a more-than-human sense have strengthened a shared storyline by foregrounding a concern with environmental change, awareness of multi-scalar change, an interest in social–ecological system dynamics, recognition of non-human rights, and an emphasis on collaborative work with communities to build local cultural and ecological literacy.

Finally, in an STT field that is increasingly laden with commitments to complex, holistic and transdisciplinary agendas, we found corpus linguistic tools valuable to identify underlying priorities and differences that are otherwise hard to ascertain. While we surfaced challenges that we faced when using corpus analysis, we see several ways that future research can use insights gained from this study and use CADS techniques to address priorities in environmental sustainability. Three examples that could assist place-based practitioners include:

(i) Expanding the integration of environmental education with STT literature to identify opportunities from integrating practices and theories for change. A focused corpus-based study, including sources from environmental education as well as STT literature, could help identify opportunities for such dialogue.

(ii) CADS could explore place-based discourses in broader society by prioritising scale-linking concepts such as *bioregions* and *biocultural diversity,* conceptually central terms such as *ecological literacy,* or locally specific references such as terms from Indigenous cultures. There are also rich opportunities to integrate themes of place, techniques in CADS and 'culturomic' perspectives by investigating how different place-based actors present taxa of local plants and animals in their language. This may help to identify and distinguish the types of "place-based change" being pursued in different contexts.

(iii) Across these topics, there are opportunities for CADS to make use of web corpora to explore sustainability discourses across locations, specialist corpora to explore discourses in specific locations, and diachronic corpora to trace the shift in discourses over time.

We also see opportunities for discursive research to pursue methodological and theoretical opportunities identified in this research. They include:

(iv) Broadening the data used in CADS to include interviews with researchers and practitioners participating in the discourses of interest.

(v) Exploring the terms that were useful markers of different postures. For example, this paper found the term "change" was useful to ascertain divergent attitudes amongst agents involved in pursuing and promoting sustainability.

(vi) Most directly building on this study, CADS could be used to investigate the discourse of place-based sustainability in a larger sample of public data. The use of automated web corpora was found to be insightful for this purpose.

Declarations

Conflict of interest The authors have no competing interests to declare that are relevant to the content of this article.

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References

Abson DJ, Fischer J, Leventon J, Newig J, Schomerus T, Vilsmaier U, von Wehrden H, Abernethy P, Ives CD, Jager NW, Lang DJ (2017) Leverage points for sustainability transformation. Ambio 46(1):30–39. https://doi.org/10.1007/s13280-016-0800-y

AELA (n.d.) Australian Earth laws alliance network. Retrieved from https://www.earthlaws.org.au/. Accessed 23 Feb 2024

Audet R (2016) Transition as discourse. Int J Sustain Dev 19(4):365–382. https://doi.org/10.1504/IJSD.2016.080512

Baker P (2006) Using corpora in discourse analysis. Bloomsbury Academic, London

Baker P, McEnery T (2015) Corpora and discourse. Palgrave Macmillan, New York

Baker P, Gabrielatos C, KhosraviNik M, Krzyżanowski M, McEnery T, Wodak R (2008) A useful methodological synergy? Combining critical discourse analysis and corpus linguistics to examine discourses of refugees and asylum seekers in the UK press. Discourse Soc 19(3):273–306. https://doi.org/10.1177/0957926508088962

Balvanera P, Daw TM, Gardner TA, Martín-López B, Norström AV, Ifejika Speranza C, Spierenburg M, Bennett EM, Farfan M, Hamann M, Kittinger JN, Luthe T, Maass M, Peterson GD, Perez-Verdin G (2017) Key features for more successful place-based sustainability research on social–ecological systems: a Programme on Ecosystem Change and Society (PECS) perspective. Ecol Soc. https://doi.org/10.5751/ES-08826-220114

Baroni M, Kilgarriff A, Pomikálek J, Rychlý P (2006) WebBootCaT: a web tool for instant corpora. Retrieved from https://www.sketchengine.eu/guide/create-a-corpus-from-the-web/. Accessed 26 July 2022

Bawaka Country, Wright S, Suchet-Pearson S, Lloyd K, Burarrwanga L, Ganambarr R, Ganambarr-Stubbs M, Ganambarr B, Maymuru D, Sweeney J (2015) Co-becoming Bawaka: towards a relational understanding of place/space. Prog Hum Geogr 40(4):455–475. https://doi.org/10.1177/0309132515589437

Bennett EM, Biggs R, Peterson GD, Gordon LJ (2021) Patchwork Earth: navigating pathways to just, thriving, and sustainable futures. One Earth 4(2):172–176. https://doi.org/10.1016/j.oneear.2021.01.004

Berkes F, Folke C (eds) (1998) Linking sociological and ecological systems: management practices and social mechanisms for building resilience. Cambridge University Press, New York

Caniglia G, Luederitz C, von Wirth T, Fazey I, Martín-López B, Hondrila K, König A, von Wehrden H, Schäpke NA, Laubichler MD, Lang DJ (2021) A pluralistic and integrated approach to action-oriented knowledge for sustainability. Nat Sustain 4(2):93–100. https://doi.org/10.1038/s41893-020-00616-z

Carpenter SR, Folke C, Norström A, Olsson O, Schultz L, Agarwal B, Balvanera P, Campbell B, Castilla JC, Cramer W, DeFries R, Eyzaguirre P, Hughes TP, Polasky S, Sanusi Z, Scholes R, Spierenburg M (2012) Program on ecosystem change and society: an international research strategy for integrated social–ecological systems. Curr Opin Environ Sustain 4(1):134–138. https://doi.org/10.1016/j.cosust.2012.01.001

Chan KMA, Gould RK, Pascual U (2018) Editorial overview: relational values: what are they, and what's the fuss about? Curr Opin Environ Sustain 35:A1–A7. https://doi.org/10.1016/j.cosust.2018.11.003

Chapin FS, Knapp CN (2015) Sense of place: a process for identifying and negotiating potentially contested visions of sustainability. Environ Sci Policy 53:38–46. https://doi.org/10.1016/j.envsci.2015.04.012

Charles L, Dodge J, Milliman L, Stockley V (1981) Where you at? A bioregional quiz. Coevol Q Winter (1)

Chase L (2017) Historical review of place-based approaches. Report by Lankelly Chase for the Institute for Voluntary Action Research. London, U.K.

Committee for Sydney (CfS) (2023) Nature positive Sydney: valuing Sydney's living infrastructure. Retrieved from https://sydney.org.au/wp-content/uploads/2023/02/Committee-for-Sydney-Nature-Positive-Sydney-February-2023.pdf. Accessed 31 Aug 2023

Cresswell T (2004/2015) Place: an introduction, 2nd edn. Backwell Publishing Ltd., Malden

Department of Planning and Environment (DPE) (2023) Sydney to host world's first global nature positive summit. New South Wales Government. [Press release: 28/8/2023]

Donse S (ed) (2020) Landscape as protagonist. Collingwood, Australia: Molongo

Drury M, Fuller J, Hoeks J (2023) Embedding animals within a definition of sustainability. Sustain Sci 18(4):1925–1938. https://doi.org/10.1007/s11625-023-01310-7

Dryzek JS (2013) The politics of the Earth: environmental discourses. Oxford University Press, Oxford

Egbert J, Biber D (2019) Incorporating text dispersion into keyword analyses. Corpora 14(1):77–104. https://doi.org/10.3366/cor.2019.0162

Enqvist JP, Campbell LK, Stedman RC, Svendsen ES (2019) Place meanings on the urban waterfront: a typology of stewardships. Sustain Sci 14(3):589–605. https://doi.org/10.1007/s11625-019-00660-5

Fazey I, Schäpke N, Caniglia G, Hodgson A, Kendrick I, Lyon C, Page G, Patterson J, Riedy C, Strasser T, Verveen S, Adams D, Goldstein B, Klaes M, Leicester G, Linyard A, McCurdy A, Ryan P, Sharpe B, Kliem L (2020) Transforming knowledge systems for life on Earth: visions of future systems and how to get there. Energy Res Soc Sci. https://doi.org/10.1016/j.erss.2020.101724

Feola G, Jaworska S (2019) One transition, many transitions? A corpus-based study of societal sustainability transition discourses in four civil society's proposals. Sustain Sci 14(6):1643–1656. https://doi.org/10.1007/s11625-018-0631-9

Fernández-Llamazares A (2022) Human-nature inter-relationships through a biocultural lens. People Nat Virtual Issue. https://besjournals.onlinelibrary.wiley.com/doi/toc/10.1002/(ISSN)2575-8314.human-nature-inter-relations-through-a-biocultural-lens. Accessed 8 Aug 2023

Folke C (2006) Resilience: the emergence of a perspective for social–ecological systems analyses. Glob Environ Change 16(3):253–267. https://doi.org/10.1016/j.gloenvcha.2006.04.002

Frantzeskaki N, Oke C, Barnett G, Bekessy S, Bush J, Fitzsimons J, Ignatieva M, Kendal D, Kingsley J, Mumaw L, Ossola A (2022) A transformative mission for prioritising nature in Australian cities. Ambio. https://doi.org/10.1007/s13280-022-01725-z

Gabrielatos C (2018) Keyness analysis: nature, metrics and techniques. In: Taylor C, Marchi A (eds) Corpus approaches to discourse: a crtitical review. Routledge, Oxford

Gatto M (2014) Web as corpus: theory and practice. Bloomsbury Publishing, London

GFN (2022) Global footprint network: footprint calculator (website). Retrieved from https://www.footprintcalculator.org. Accessed 26 July 2022

Gow EA, Burant JB, Sutton AO, Freeman NE, Grahame ERM, Fuirst M, Sorensen MC, Knight SM, Clyde HE, Quarrell NJ, Wilcox AAE, Chicalo R, Van Drunen SG, Shiffman DS (2022) Popular press portrayal of issues surrounding free-roaming domestic cats *Felis catus*. People Nat 4(1):143–154. https://doi.org/10.1002/pan3.10269

Grundmann R, Krishnamurthy R (2010) The discourse of climate change: a corpus-based approach. Crit Approaches Discourse Anal across Discip 4(2):125–146

Hajer M (1995) The politics of environmental discourse: ecological modernization and the policy process. Clarendon Press, Oxford

Hajer M (2006) Doing discourse analysis: coalitions, practices, meaning. In: van den Brink M, Metze T (eds) Words matter in policy and planning: discourse theory and method in the social sciences. Koninklijk Nederlands Aardrijkskundig Genootschap, Utrecht, pp 65–74

Hakkarainen V, Soini K, Dessein J, Raymond CM (2022) Place-embedded agency: exploring knowledge–place connections for enabling plurality in governance of social–ecological systems. People Nat 4(5):1141–1158. https://doi.org/10.1002/pan3.10365

Hanspach J, Haider J, Oteros-Rozas E, Olafsson A, Gulsrud N, Raymond M, Torralba M, Martín-López B, Bieling C, Garcia-Martin M, Albert C, Beery H, Fagerholm N, Díaz-Reviriego I, Drews-Shambroom A, Plieninger T (2020) Biocultural approaches to sustainability: a systematic review of the scientific literature. People Nat 2:1–17. https://doi.org/10.1002/pan3.10120

Haraway DJ (2016) Staying with the trouble: making kin in the Chthulucene. Duke University Press, Durham

Horlings LG, Nieto-Romero M, Pisters S, Soini K (2020a) Operationalising transformative sustainability science through place-based research: the role of researchers. Sustain Sci 15(2):467–484. https://doi.org/10.1007/s11625-019-00757-x

Horlings LG, Roep D, Mathijs E, Marsden T (2020b) Exploring the transformative capacity of place-shaping practices. Sustain Sci 15:353–362. https://doi.org/10.1007/s11625-020-00787-w

Horsbøl A (2020) Green conflicts in environmental discourse. A topos based integrative analysis of critical voices. Crit Discourse Stud 17(4):429–446

Hubbard E, Wearne S, Jónás K, Norton J, Wilke M (2023) Where are you at? Re-engaging bioregional ideas and what they offer geography. Geogr Compass 17(10):e12722. https://doi.org/10.1111/gec3.12722

Hull V, Liu J (2018) Telecoupling: a new frontier for global sustainability. Ecol Soc. https://doi.org/10.5751/ES-10494-230441

Ives CD, Giusti M, Fischer J, Abson DJ, Klaniecki K, Dorninger C, Laudan J, Barthel S, Abernethy P, Martín-López B, Raymond CM, Kendal D, von Wehrden H (2017) Human–nature connection: a multidisciplinary review. Curr Opin Environ Sustain 26–27:106–113. https://doi.org/10.1016/j.cosust.2017.05.005

Jickling B, Wals AEJ (2008) Globalization and environmental education: looking beyond sustainable development. J Curric Stud 40(1):1–21. https://doi.org/10.1080/00220270701684667

Jørgensen M, Phillips LJ (2002) Discourse analysis as theory and method. SAGE Publications Ltd. https://doi.org/10.4135/9781849208871

Kagan S (2019) Proving the world more imaginary?: four approaches to imagining sustainability in sustainability research. Osterreichische Zeitschrift fur Soziologie 44:157–178. https://doi.org/10.1007/s11614-019-00378-9

Kilgarriff A (2009) Simple maths for keywords. Paper presented at the Proceedings of Corpus Linguistics Conference CL2009, University of Liverpool

Kilgarriff A, Rychlý P, Smrž P, Tugwell D (2004) The sketch engine. Paper presented at the Proceedings of the 11th EURALEX International Congress

Kilgarriff A, Baisa V, Bušta J, Jakubíček M, Kovář V, Michelfeit J, Rychlý P, Suchomel V (2014) The sketch engine: ten years on. Lexicography 1(1):7–36. https://doi.org/10.1007/s40607-014-0009-9

Ladle RJ, Jepson P, Correia RA, Malhado ACM (2019) A culturomics approach to quantifying the salience of species on the global internet. People Nat 1(4):524–532. https://doi.org/10.1002/pan3.10053

Langer L, Burghardt M, Borgards R, Böhning-Gaese K, Seppelt R, Wirth C (2021) The rise and fall of biodiversity in literature: a comprehensive quantification of historical changes in the use of vernacular labels for biological taxa in Western creative literature. People Nat 3(5):1093–1109. https://doi.org/10.1002/pan3.10256

Leedham M, Lillis T, Twiner A (2020) Exploring the core 'preoccupation' of social work writing: a corpus-assisted discourse study. J Corpora Discourse Stud 3:1–26. https://doi.org/10.18573/jcads.26

Leipold S, Feindt PH, Winkel G, Keller R (2019) Discourse analysis of environmental policy revisited: traditions, trends, perspectives. J Environ Plan Policy Manag 21(5):445–463. https://doi.org/10.1080/1523908X.2019.1660462

Leventon J, Abson DJ, Lang DJ (2021) Leverage points for sustainability transformations: nine guiding questions for sustainability science and practice. Sustain Sci 16(3):721–726. https://doi.org/10.1007/s11625-021-00961-8

Loorbach D, Wittmayer J, Avelino F, von Wirth T, Frantzeskaki N (2020) Transformative innovation and translocal diffusion. Environ Innov Soc Trans 35:251–260. https://doi.org/10.1016/j.eist.2020.01.009

MacGillivray BH (2015) The position of place in governing global problems: A mechanistic account of place-as-context, and analysis of transitions towards spatially explicit approaches to climate science and policy. Environ Sci Policy 53:8–17. https://doi.org/10.1016/j.envsci.2015.05.015

MacGillivray BH, Franklin A (2015) Place as a boundary device for the sustainability sciences: concepts of place, their value in characterising sustainability problems, and their role in fostering integrative research and action. Environ Sci Policy 53:1–7. https://doi.org/10.1016/j.envsci.2015.06.021

Maffi L (ed) (2001) On biocultural diversity: linking language, knowledge, and the environment. Smithsonian Institution Press, Washington

Maffi L (2005) Linguistic, cultural and biological diversity. Annu Rev Anthropol. https://doi.org/10.1146/annurev.anthro

Massey D (2004) Geographies of responsibility. Geogr Ann Ser b: Hum Geogr 86(1):5–18. https://doi.org/10.1111/j.0435-3684.2004.00150.x

Masterson VA, Stedman RC, Enqvist J, Tengö M, Giusti M, Wahl D, Svedin U (2017) The contribution of sense of place to social–ecological systems research: a review and research agenda. Ecol Soc. https://doi.org/10.5751/ES-08872-220149

Masterson VA, Enqvist JP, Stedman RC, Tengö M (2019) Sense of place in social–ecological systems: from theory to empirics. Sustain Sci 14(3):555–564. https://doi.org/10.1007/s11625-019-00695-8

Mautner G (2019) A research note on corpora and discourse: points to ponder in research design. J Corpora Discourse Stud 2:2–13. https://doi.org/10.18573/jcads.32

Mehmood A, Marsden T, Taherzadeh A, Axinte LF, Rebelo C (2020) Transformative roles of people and places: learning, experiencing, and regenerative action through social innovation. Sustain Sci 15(2):455–466. https://doi.org/10.1007/s11625-019-00740-6

Mezirow J (1993) A transformation theory of adult learning. Paper presented at the adult education research annual conference proceedings

New South Wales Government Architect (GANSW) (2023) Better placed: connecting with country framework. Retrieved from https://www.governmentarchitect.nsw.gov.au/projects/designing-with-country. Accessed 31 Aug 2023

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

Norström AV, Agarwal B, Balvanera P, Baptiste B, Bennett EM, Brondízio E, Biggs R, Campbell B, Carpenter SR, Castilla JC, Castro AJ, Cramer W, Cumming GS, Felipe-Lucia M, Fischer J, Folke C, DeFries R, Gelcich S, Groth J, Ifejika Speranza C, Jacobs S, Hofmann J, Hughes TP, Lam DPM, Loos J, Manyani A, Martín-López B, Meacham M, Moersberger H, Nagendra H, Pereira L, Polasky S, Schoon M, Schultz L, Selomane O, Spierenburg M (2022) The programme on ecosystem change and society (PECS)—a decade of deepening social–ecological research through a place-based focus. Ecosyst People 18(1):598–608. https://doi.org/10.1080/26395916.2022.2133173

Orr D (1992) Ecological literacy: education and the transition to a postmodern world. State University of New York Press, Albany

Orr D (2004) Earth In Mind: on education, the environment, and the human prospect (10th Anniversay Edition (original work published 1994) ed.). Island Press, Washington

Partington A (2006) Metaphors, motifs and similes across discourse types: Corpus-Assisted Discourse Studies (CADS) at work. Trends Linguist Stud Monogr 171:267

Pereira LM, Davies KK, den Belder E, Ferrier S, Karlsson-Vinkhuyzen S, Kim H, Kuiper JJ, Okayasu S, Palomo MG, Pereira HM, Peterson G, Sathyapalan J, Schoolenberg M, Alkemade R, Carvalho Ribeiro S, Greenaway A, Hauck J, King N, Lazarova T, Ravera F, Chettri N, Cheung WWL, Hendriks RJJ, Kolomytsev G, Leadley P, Metzger J-P, Ninan KN, Pichs R, Popp A, Rondinini C, Rosa I, van Vuuren D, Lundquist CJ (2020) Developing multiscale and integrative nature–people scenarios using the Nature Futures Framework. People Nat 2(4):1172–1195. https://doi.org/10.1002/pan3.10146

Pereira L, Asrar GR, Bhargava R, Fisher LH, Hsu A, Jabbour J, Nel J, Selomane O, Sitas N, Trisos C, Ward J, van den Ende M, Vervoort J, Weinfurter A (2021) Grounding global environmental assessments through bottom-up futures based on local practices and perspectives. Sustain Sci 16(6):1907–1922. https://doi.org/10.1007/s11625-021-01013-x

Pisters SR, Vihinen H, Figueiredo E (2019) Place based transformative learning: a framework to explore consciousness in sustainability initiatives. Emot Space Soc 32:100578. https://doi.org/10.1016/j.emospa.2019.04.007

Plumwood V (2008) Shadow places and the politics of dwelling. Aust Humanit Rev 44:139–150. https://doi.org/10.22459/AHR.44.2008

Rebelo C, Mehmood A, Marsden T (2020) Co-created visual narratives and inclusive place branding: a socially responsible approach to residents' participation and engagement. Sustain Sci 15(2):423–435. https://doi.org/10.1007/s11625-019-00760-2

Riechers M, Balázsi Á, García-Llorente M, Loos J (2021) Human–nature connectedness as leverage point. Ecosyst People 17(1):215–221. https://doi.org/10.1080/26395916.2021.1912830

Riedy C (2020) Discourse coalitions for sustainability transformations: common ground and conflict beyond neoliberalism. Curr Opin Environ Sustain 45:100–112. https://doi.org/10.1016/j.cosust.2020.09.014

Riedy C (2022) Discursive entrepreneurship: ethical meaning-making as a transformative practice for sustainable futures. Sustain Sci 17:541–554. https://doi.org/10.1007/s11625-021-00978-z

Sanscartier MD (2018) The craft attitude: navigating mess in mixed methods research. J Mixed Methods Res 14(1):47–62. https://doi.org/10.1177/1558689818816248

Scoones I, Stirling A, Abrol D, Atela J, Charli-Joseph L, Eakin H, Ely A, Olsson P, Pereira L, Priya R, van Zwanenberg P, Yang L (2020) Transformations to sustainability: combining structural, systemic and enabling approaches. Curr Opin Environ Sustain 42:65–75. https://doi.org/10.1016/j.cosust.2019.12.004

Scott N (1999) WordSmith tools manual. Version 3.0. Oxford University Press, Oxford

Sharp EL, Brierley GJ, Salmond J, Lewis N (2022) Geoethical futures: a call for more-than-human physical geography. Environ Plann F 1(1):66–81. https://doi.org/10.1177/26349825221082168

Simoens MC, Fuenfschilling L, Leipold S (2022) Discursive dynamics and lock-ins in socio-technical systems: an overview and a way forward. Sustain Sci 17(5):1841–1853. https://doi.org/10.1007/s11625-022-01110-5

Sinclair J (2005) Corpus and text. Basic principles. In: Wynne M (ed) Developing linguistic corpora: a guide to good practice. Oxbow Books, Oxford, pp 1–16. https://ahds.ac.uk/linuigstic-corpora/

Soares da Silva D, Horlings LG (2020) The role of local energy initiatives in co-producing sustainable places. Sustain Sci 15(2):363–377. https://doi.org/10.1007/s11625-019-00762-0

Stålhammar S, Thorén H (2019) Three perspectives on relational values of nature. Sustain Sci 14(5):1201–1212. https://doi.org/10.1007/s11625-019-00718-4

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

Stevenson RB, Brody M, Dillon J, Wals AEJ (2012) International handbook of research on environmental education. Taylor & Francis Group, London

Stubbs M (2001) Words and phrases: corpus studies of lexical semantics. Blackwell Publishers, Oxford

Taskforce on Nature-Related Financial Disclosures (TNFD) (2023) Taskforce on nature-related financial disclosures website. Retrieved from https://tnfd.global. Accessed 31 Aug 2023

Tomaney J (2010) Place-based approaches to regional development: global trends and Australian implications. Australian Business Foundation, Sydney, Australia

Tuan Y-F (1977) Space and place: the perspective of experience. University of Minnesota Press, Minneapolis

UNESCO (2014) Shaping the future we want: UN decade of education for sustainable development (2005–2014). Final Report. Paris, France

UNESCO (2016) Global education monitoring report. Education for people and planet: creating sustainable futures for all. Retrieved from Paris, France

Verbrugge L, Buchecker M, Garcia X, Gottwald S, Müller S, Præstholm S, Stahl Olafsson A (2019) Integrating sense of place in planning and management of multifunctional river landscapes: experiences from five European case studies. Sustain Sci 14(3):669–680. https://doi.org/10.1007/s11625-019-00686-9

Waddock S (2016) Foundational memes for a new narrative about the role of business in society. Humanist Manag J 1(1):91–105. https://doi.org/10.1007/s41463-016-0012-4

Wearne S (2023) Are we practicing what we preach? Scaling out knowledge system infrastructure for sustainability transformations. Place-based publications: a provocation and proposal. Soc Innov J 22. Retrieved from https://socialinnovationsjournal.com/index.php/sij/article/view/6972

Wearne S, Hubbard E, Jónás K, Wilke M (2023) A learning journey into contemporary bioregionalism. People Nat 5(6):2124–2140. https://doi.org/10.1002/pan3.10548

West S, Haider LJ, Masterson V, Enqvist JP, Svedin U, Tengö M (2018) Stewardship, care and relational values. Curr Opin Environ Sustain 35:30–38. https://doi.org/10.1016/j.cosust.2018.10.008

West S, Haider LJ, Stålhammar S, Woroniecki S (2020) A relational turn for sustainability science? Relational thinking, leverage points and transformations. Ecosyst People 16(1):304–325. https://doi.org/10.1080/26395916.2020.1814417

Whatmore S (2002) Hybrid geographies. Sage Publications Ltd., New York

Wild K, Church A, McCarthy D, Burgess J (2013) Quantifying lexical usage: vocabulary pertaining to ecosystems and the environment. Corpora 8(1):53–79. https://doi.org/10.3366/cor.2013.0034

Wooltorton S, Collard L, Horwitz P, Poelina A, Palmer D (2020) Sharing a place-based indigenous methodology and learnings. Environ Educ Res 26:1–18. https://doi.org/10.1080/13504622.2020.1773407

Wyborn C, Montana J, Kalas N, Clement S, Davila F, Knowles N, Louder E, Balan M, Chambers J, Christel L, Forsyth T, Henderson G, Izquierdo Tort S, Lim M, Martinez-Harms MJ, Merçon J, Nuesiri E, Pereira L, Pilbeam V, Turnhout E, Wood S, Ryan M (2020) An agenda for research and action toward diverse and just futures for life on Earth. Conserv Biol. https://doi.org/10.1111/cobi.13671