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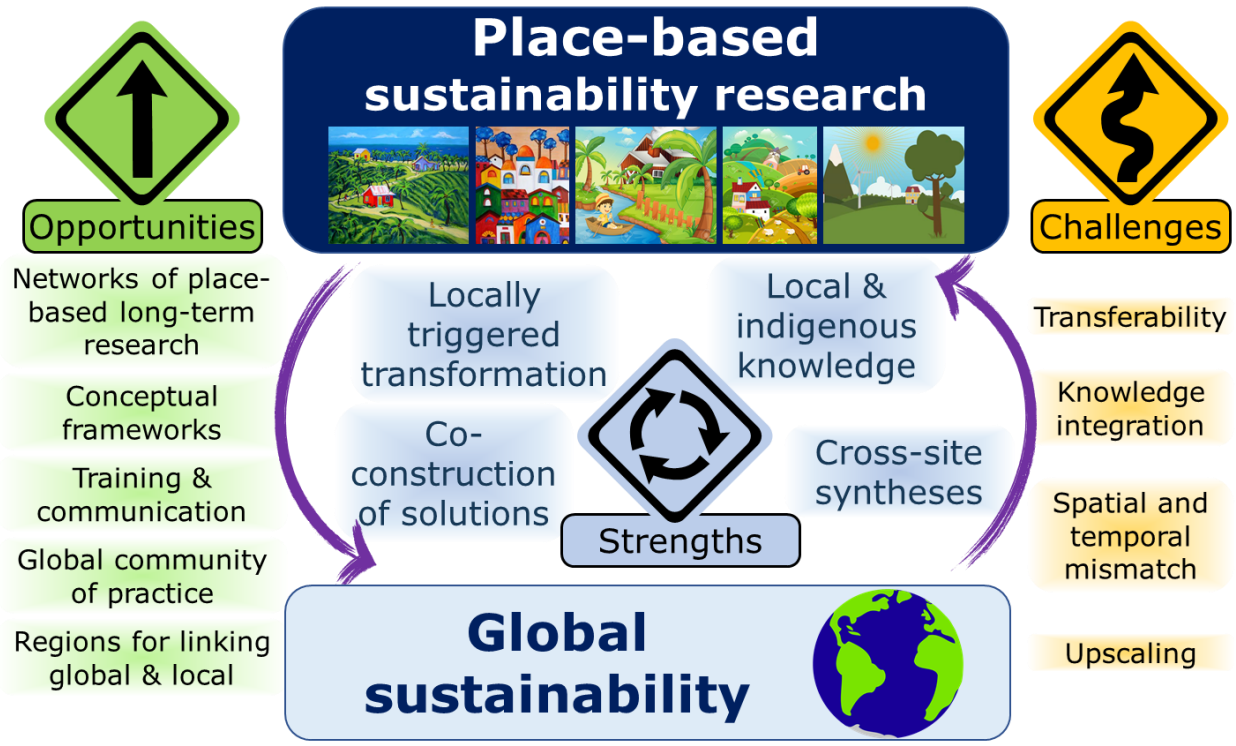
Abstract

Global sustainability initiatives are gaining momentum and impact, and place-based research can provide complementary insights to strengthen them. Here, we explore the current and potential role of place-based research into informing global sustainability initiatives by assessing the strengths, challenges, and opportunities. We show that place-based research allows for a better understanding of global social–ecological dynamics, and that transformations towards sustainability are often triggered at the local scale through the co-construction of local solutions. We discuss that the very nature of place-based research can hinder its transferability because its global integration faces temporal, spatial and governance scale mismatches, and we identify some of the key challenges of scaling-up its findings. We highlight new opportunities to mainstream place-based research that are emerging from first, long-term networks of place-based research, second, new institutional research settings that contribute with conceptual comprehensive frameworks and capacity building tools, third, a global community of practice, and fourth, the concept of region as a bridge between local and global sustainability initiatives. We believe that the time is ripe to promote the role of place-based social–ecological research as a key contributor to achieve global sustainability goals.

Graphical abstract



Introduction

Global sustainability initiatives have increasingly been addressed by global top-down initiatives, but the abundant and diverse bottom-up initiatives should be urgently acknowledged [1*]. The global biodiversity outlook (GBO) is just one of the many multi-national research, monitoring, or synthesis enterprises that contribute significantly towards informing the global sustainability agenda. Whilst cross-scale linkages within social–ecological systems are at the core of the search for sustainability, solutions towards sustainability are context-specific [2], and relatively little insights from place-based social–ecological research are currently being used to inform and inspire global sustainability research. For instance, extensive work has been done on the development of locally relevant future scenarios [3*], and yet global scale scenarios provide only very rough simplifications of contrasting social–ecological alternatives [4].

Place-based research addresses the particularities of specific landscapes, seascapes or transitional zones as dynamic social–ecological systems [5*]. A place (e.g. Mexico City) or a region (e.g. Sub-Saharan Africa) is not only a territorially bounded spatial unit with features that make it unique or distinguishable from other areas, but it is also where social, economic and political influences converge, as well as where multiple biophysical and societal flows and networks meet [6-8]. Place-based social–ecological research, aimed at understanding how social–ecological systems evolve over time and respond to policy interventions through the exchange of knowledge across disciplinary boundaries and among different stakeholders to address sustainability challenges at a particular place [5*,9*,10*], is uniquely positioned to explore the interplay between the local and the global scales, by recognizing the distinctiveness of local entities, while addressing the impacts of global dynamics from them [11**].

Scaling up of local insights and successful initiatives into global sustainability research is underway. Initiatives such as the ‘Good Anthropocene’ project [12] are aimed at identifying the multiple new strategies developed towards creating a more just, prosperous, and ecologically diverse world developed by numerous individuals, organizations, and political leaders, to sustain and amplify these efforts towards achieving large-scale transformations. Yet, much more is needed. In this paper, we explore the current and potential role of place-based social–ecological research into informing the global sustainability scientific and policy agendas by assessing its strengths, challenges and opportunities.

Strengths

Place-based social–ecological research allows for a better understanding of the linkages between global and local sustainability

It explores how micro-processes (e.g. exchanges between individuals) scale-up, how macro-processes (e.g. global market streams) scale down, and how local social–ecological systems interact with each other, by focusing on interactions across scales, and on the identification of fast and slow drivers of social and ecological change, thresholds, traps and time lags [11**,13]. Insights on global impacts of widespread localized groundwater depletion from the in-depth exploration of a few contrasting cases [13], as well as efforts to refine the spatial resolution of climate models at local scales by incorporating indigenous knowledge on changing climate [14], emerge from place-based research. While top-down approaches can propose theoretical pathways, only comparisons across sites [5*] can allow to explore how actual local insights and are needed to achieve sustainability at a global scale.

Transformations towards sustainability are often triggered at the local scale

Local social–ecological experiences, including conflicts [15] as well as initiatives that foster equity and sustainability [12] can be used to identify useful tools and lessons for global environmental governance [16]. While specific solutions are not scalable *per se* [17], the lessons learned from their implementation and specifically from the interactions among local stakeholders can be scaled up to delineate pathways towards sustainability transformations [12]. Also, the uptake of these lessons can occur at a range of scales, ranging from individuals to multilateral agreements [18]. Insights from place-based research allows for changing values that hinder the achievement of global sustainability goals, and for inspiring alternative development pathways and practices for the future [12].

Place-based research fosters the co-construction of solutions

A genuine local problem, worth addressing, worth solving by a wide range of actors (e.g. researchers, businesses, government and the civil society) provides a unique opportunity to engage different perspectives (e.g. land-scape management, cultural significance), disciplines (e.g. ecology, economics or political sciences) and knowledge systems (e.g. indigenous and local knowledge, scientific or technical knowledge) [9*,19]. The attachment to a ‘place’ and the objective of finding solutions can foster the involvement of the different actors, as well as ensure academic quality and local pertinence of the research [20,21]. The resulting co-produced knowledge is more likely to be useful and acceptable than knowledge produced only by one type of stakeholder [22] or by top-down (e.g. developed by governments) directives [23].**Place-based research renders the important contribution of indigenous and local knowledge visible**

Biocultural diversity plays a key role in the resilience of social–ecological systems [24,25]. Local communities who depend on natural resources have developed practices, institutions, and knowledge to adapt to social and environ- mental changes [26], and many of them hold precious knowledge of how biological and cultural diversity can enhance the ability of societies to cope with present and future global changes [27]. While the longevity of many traditional management practices is a testament to their ability to adapt to changing environmental and social conditions, as well as to their local suitability, some of these practices can be highly unsustainable or lead to unpredicted and undesired outcomes [28].

Challenges

The very nature of place-based research can hinder its transferability

Place-based research develops around locally relevant issues, which vary among social-ecological contexts. Instead, global sustainability issues are those that are common across multiple places and contexts, or those that are made visible by more influential or interconnected stakeholders, or by global bodies. This means that local issues may not relevant at global scales, or just not been explicitly integrated into global discourses. Views on what constitutes a relevant issue or a solution are strongly dependent on knowledge derived from direct experiences [29]. Local narratives associated with analogous issues can radically differ within and among sites hindering their integration into global discourses, as is the case of contrasting views on the impacts of large carnivores on people's livelihoods in different continents [30-32]. Additionally, transferability across sites can be hindered by communication barriers. Insights gained in a specific context may not be easily transferred to larger scales due to stark contrasts in world views, perceptions, or needs, including different languages and dialects. For example, when place-based research findings on fire management in Alaska contradicted national policy narratives, results from place-based science were questioned [33].

The integration of different knowledge systems into place-based research is both a strength and a challenge

An evidence-based approach that allows for the integration of different knowledge systems is increasingly seen as key to more resilient governance [34,35]. Yet, the credibility of indigenous and local knowledge by national or international actors is still an issue in some arenas [36]. It is particularly challenging to transfer place-based knowledge that is culturally sensitive and even sacred, such as that from indigenous communities that may mistrust the use of their knowledge by 'outsiders' [37]. The co-production of knowledge inherent to place-based research can limit the transferability of its outcomes, because it often requires capacity building and long-term involvement of multiple actors. Co-production of knowledge also poses the question of whose voices must be included in outreach strategies and science-policy interface [38,39], and requires developing mechanisms to leverage power imbalances [40,41].

Global integration of place-based sustainability research faces mismatches in spatial and temporal scales

It takes time for local issues to be globally recognized, as is the case of the increasing degradation of African savannahs due to bush encroachment [42]. Further, the local implementation of solutions, such as local interventions to address degraded soils, can take a long time to show impacts at larger scales than local [43]. Also, global drivers have different impacts in different local contexts, leading to very different responses at local scales. For instance, climate change can lead to increasing precipitation in some areas and increasing drought in others, and a variety of responses that are implemented and transmitted at local or regional scales are being developed [14,34].

Upscaling place-based research faces several methodological challenges

First, identifying the systems' boundaries faces some methodological challenges because they depend on the problem to be addressed and the scales associated to it [44-46]. Second, mobilizing data from multiple case studies to perform cross-site assessments requires tailoring

research protocols to each specific case study, and particular research team [10*]. This challenge requires an adaptation of research methods [5*] to ensure the integration of local insights into the co-production of knowledge [47]. Third, scaling up insights gained from place-based social-ecological research is dependent on new theoretical frameworks that will advance our understanding of how to assess multi-scale dynamics [48*]. Fourth, more research is needed on why, when, and how can insights from a particular place and context be exported to other analogous scales, or scaled up at larger spatial or institutional and governance scales. Fifth, the actual upscaling of successful initiatives developed from place-based research, such as the development of participatory monitoring schemes, can be hindered by how much relevant stakeholders are willing to be involved in them [49].

Opportunities

Networks of place-based long-term social-ecological transdisciplinary teams are critical to inform the global sustainability scientific and political agendas

Understanding the local complexity of each social–ecological system, as well as the variability across contexts of these systems, can inform the search for pathways towards sustainability [5*,50,51]. By establishing a network of transdisciplinary research teams, the complex dynamics of socio-ecological systems can be further unraveled from the identification of key processes that operate across sites, the context dependent interactions among them, as well as commonalities and specificities of the alternatives identified among places facing similar sustainability issues [10*,12,45,52]. The long-term monitoring of the dynamics of social–ecological systems and the co-generation of alternatives, is needed to identify the occurrence and consequences of unusual, extreme or critical events [20]. Also, syntheses across place-based social–ecological research sites can inform, for example, key features for more successful place-based social–ecological sustainability research [10*], or the potential impacts of participatory scenario planning [3*].

New research initiatives and new institutional settings can foster the integration of place-based research insights into global sustainability research and policy agendas

Research networks (Table 1) such as the Program for Ecosystem Change and Society [11**] and the Knowledge Action Networks of Future Earth [53] are already mainstreaming place-based research into global sustainability initiatives. Similarly, global scale science-policy initiatives are synthesizing results from place-based research by promoting and facilitating communicating among scientists, managers and stakeholders on sustainability issues (Table 1).

Table 1

Initiatives that foster the uptake of place-based research into global sustainability.

Name	Realm of action	Institutions	Description	Aims	Conceptual frameworks and methodological tools	References and links to websites
Program for Ecosystem Change and Society	Research	Stockholm Resilience Center	Network of place-based social-ecological research projects (18 registered to date)	Foster coordinated place-based research to understand the dynamic relationship between humans and ecosystems	Resilience of social-ecological systems, comparisons across sites, across thematic issue	Norstrom *et al.*, 2017 http://bit.ly/2wWrZc0
Knowledge Action Networks	Research	Future Earth	Collaborative frameworks that will facilitate highly integrative sustainability research	Generate the multifaceted knowledge needed to inform solutions for complex societal issues	Development of new interdisciplinary and transdisciplinary approaches to assessing transformations towards sustainability at a range of spatial scales	Munoz et *al.*, 2016 http://bit.ly/2vDdDsG
Long-term Social-Ecological Research Project	Research	International Long-Term Ecological Research Network (ILTER) and Program on Ecosystem Change and Society (PECS)	Social-ecological research network of long-term sites	Assessing changes in biodiversity and trade-offs among ecosystem services, stakeholders, and components of well-being will be monitored	Long-term research sites, network of sites, collaboration among networks	Maass *et al.*, 2016
Regional Office for Africa (ICSU ROA)	Research and links to policy and key decision makers	International Council for Science (ICSU)	Regional office of international research initiatives (in Africa)	Promoting, facilitating and coordinating scientific activities, establishing research consortia and aligning regional research to global sustainability questions	Logistic, financial and administrative support needed to interconnect place-based initiatives	http://bit.ly/2vxktkk
Eklipse Project	Science-Policy Interphase	European Union Funded projects	Network of networks	Facilitate linkages between science, policy and society, through knowledge synthesis, and identifying research priorities	Creating communication tools and platforms to mainstream insights gained at a range of spatial scales into policy design and implementation	http://bit.ly/2vDBBnF
Community of Practice	Science-Policy Interphase	Intergovernmental Science-Policy Interphase (IPBES)	Informal network of more than 1200 authors contributing to IPBES	To systematically synthesize research at local to global scales towards informing policy design on biodiversity and ecosystem services	IPBES conceptual framework to guide synthesis work from authors across regional, thematic and global assessments	
Mediterranean Waterbirds In French: Dénombrements internationaux d'oiseaux d'eau (DIOE)	Research — Practitioners Program	Tour du Valat, ONCFS, Wetlands International, French Ministry of Ecology, Sustainable Development and Energy and the MAVA Foundation	Network of local biodiversity conservationists (mostly ornithologists) and research partners	To help local biodiversity conservationists in Mediterranean wetlands to formulate aggregated messages (at several scales) for policy makers	Logistic support, expert missions, capacity building, data hosting and dissemination and communication tools and initiatives.	http://bit.ly/2iCKrkx

New conceptual frameworks are increasingly available to foster the uptake of place-based research insights into global sustainability initiatives

Complexity thinking has been shown to foster the integration of researchers and stakeholders through participative planning and adaptive decision-making process [52]. The 'telecoupling' framework [17] illustrates the increasing geographic scales of interactions between distant local places. The 'land system archetypes' concept allows assessing the transferability of place-based research to other geographical areas [54]. Planetary and regional boundaries, in terms of safe and just social– ecological spaces [55,56], are increasingly operationalized at local scales and feeding back into global narratives [55]. The Intergovernmental Platform of Biodiversity and Ecosystem Services (IPBES) assessment and valuation guidelines stress the importance of including multiple worldviews and value systems, explicitly requiring complementary knowledge from indigenous and local communities and practices alongside classic scientific data [40].

Place-based participatory scenarios can be integrated into global models in the search for pathways towards sustainability

Participatory scenario planning allows the identification of shared objectives between the local actors and researchers, building common understandings and fostering learning [3*]. A coordinated set of locally based scenarios can be linked to global scale scenarios and narratives to inform global sustainability policies [57*,58]. The consideration of alternative futures and the dynamics of the relationships within a range of social–ecological systems in space and time can be used to avoid undesirable futures, and to better inform how local social–ecological dynamics are likely to be reshaped by local and global drivers [57*].

New capacity-building opportunities and communication tools are available

Transdisciplinary courses are providing new generations with the conceptual and methodological tools to mainstream place-based research into global sustainability agendas, such as those at Alternet (http://bit.ly/ 242XInh), td-net (http://bit.ly/2wd5IY1), or the National University of Mexico (http://bit.ly/2fOgGMn). New tools of virtual communication and training that are supportive to up-scale the insights at local scale include newsletters, blogs, webinars, you-tube videos, online meetings, and live-chats to communicate distant communities and reach broad and diverse audiences (e.g. www. stockholmresilience.org, www.ipbes.net). Leaflets, radio programs, and travel exchanges allow sharing insights among different stakeholders operating at different scales (e.g. http://bit.ly/2wd3lnN or exhibitions).

A global community of practice for place-based sustainability research is rapidly growing

The construction of Communities of Practice at different scales, in which local communities, practitioners, decision makers, and researchers share expertise and visions to co-produce relevant knowledge and to nurture governance systems can significantly contribute to mobilize sustainability expertise across scales [59]. Communities of Practice foster reflexivity, collaboration, negotiation, integration, and innovation [59] and can legitimize the coproduced knowledge promoting its dissemination over many territories and through time [60].

The regional scale provides a potential conceptual bridge between local place-based research findings and global sustainability questions

By using regions (e.g. Sub-Saharan Africa), global sustainability questions can be downscaled to local places [61]. Whilst place-based research can be scaled up to the respective regional levels into policy design and implementation alternatives, regional questions can be down- scaled to local places. In this way, transdisciplinary approaches transcend the local scale and seek political support through deliberations and negotiations between science and society at various levels and between the different societies of the world, as is the case of Reducing Emissions from Deforestation and Forest Degradation (REDD+) pilot schemes [62].

Conclusions

Place-based and global sustainability insights have been developing in parallel and integration of and synergies between these processes should be stimulated. Placebased, long-term social–ecological research can uniquely advance global sustainability initiatives by generating locally relevant knowledge and solutions in a globally determined context. Whilst these cannot be directly scaled-up, lessons learned across contexts can be synthesized by using common research protocols, such as those targeted at systematically assessing lessons learned from locally developed solutions or future scenarios, at comparing key drivers that shape the dynamics of social ecological systems across scales. Insights gained from a variety of sources and context can then be mainstreamed into the global sustainability agenda through their incorporation into global synthesis initiatives such as the regional, thematic or global assessments of IPBES.

The time is ripe for developing a global network of place-based sustainability research and practice initiatives, and tools to achieve this are now available. Given the magnitude of the planetary challenges we face today, we urgently need intense collaboration within the large but scattered community of scientists and practitioners. A stronger link between place-based and global scale initiatives is needed. These are preconditions to significantly advance global sustainability thinking as well as place-based action.

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