SDG Commentary: Service ecosystems with the planet - weaving the environmental SDGs with human services

Abstract

Purpose: Humanity and all life depend on the natural environment of Planet Earth, and that environment is in acute crisis across land, sea, and air. One of a set of commentaries on how service can address the UN's sustainable development goals (SDGs), we focus on environmental goals SDG 13 (climate action), SDG 14 (life below water) and SDG 15 (life on land). This article proposes a conceptual framework that incorporates the natural environment into transformative services.

Design/methodology/approach: We trace the evolution of service thinking about the natural environment, from i) a stewardship perspective of the environment as a set of resources to be managed, through ii) an acknowledgement of non-human organisms as actors that can participate in service exchange, towards iii) an emergent concept of ecosystems as integrating human social actors and other biological actors who engage fully in value co-creation.

Findings: We derive a framework integrating human and other life forms as co-creating actors, drawing on shared natural resources to achieve mutualism, where each actor can have a net benefit from the relationship. Future research questions are posited that may help services research address SDGs 13-15.

Originality/value: The framework integrates ideas from environmental ecosystem literature to inform the nature of ecosystems. By integrating environmental actors and ecological insights into our understanding of service ecosystems, service scholars are well placed to make unique contributions to the global challenge of creating a sustainable future.

Keywords: Service ecosystems, Sustainable Development Goals, Environmental Sustainability, Climate Change, Biodiversity, Symbiosis

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Commentary: Service ecosystems with the planet - weaving the environmental SDGs with human services

Introduction

The UN's Sustainable Development Goals (SDGs) are gaining significant attention as a framework for all organizations to better serve humanity and the planet on which we live. Three of the SDGs concern the non-human natural environment: SDGs 13 (climate action), 14 (life below water) and 15 (life on land). These three SDGs are inexorably interdependent, as climate, water, and land ecosystems interact with each other – and us. Water is in the oceans, rivers, lakes, underground, in the sky; land and water combine to form watersheds, floodplains, and wetlands; and the relationship between water and land dictates and is dictated by climate and climate change. Taken together, these three SDGs challenge services organizations to transform their business models in order to better serve all actors now and into the future. The focus of our commentary is on the significance of these SDGs, their impact on service provision, and research opportunities. Given their interdependence, these three SDGs have been integrated in a single ServCollab Service Research Theme, named "Services ecosystems with the PLANET". ServCollab "is a service research organization for diagnosing and treating humanity's service problems" (Fisk *et al.*, 2020, p. 616). See Figure 1 for its relationship with other service research themes in this special issue.

A dominant definition of sustainable development shows its origins in social objectives: "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). Yet this influential report from the World Commission on Environment and Development centered on the criticality of the natural

environment in achieving sustainable development for humans. The 'triple bottom line' perspective on sustainability can trap us into thinking of social and environmental targets as separate. Yet every other SDG relating to human goals is critically dependent on each of these three (Le Blanc, 2015): as embodied intelligences, we cannot exist, let alone flourish, without a flourishing environment. Thus, ServCollab's human-centered goals are intimately interwoven with these environmental SDGs (see Table 1).

Figure 1. ServCollab's Service Research Themes and UN SDGs.

Source: Russell-Bennett, Rosenbaum, Fisk and Raciti 2023

Table 1. SDG Definitions and Alignment with ServCollab's Goals.

SDG	Definition (United Nations, 2023)	ServCollab Alignment	Future Opportunities
SDG 13: Climate Action	Take urgent action to combat climate change and its impacts	Reduce human suffering and improve well-being through collaborations that span disciplinary and national boundaries.	Consider the role, impact, and effect of non-human actors in the ecosystem and the interactions and synergies among all actors of an ecosystem.
SDG 14: Life Below Water	Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Span disciplinary boundaries to better understand and design ecosystems that elevate human experiences.	
SDG 15: Life On Land	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss		

Because the natural environment is in crisis, the prospects for human flourishing are as well. Even if every national carbon-reduction commitment made under the UN's "Paris Agreement" process is honored in full, we are on course for a temperature increase of 3 degrees this century, far above the 1.5-degree level that might avoid catastrophic tipping points (IPCC, 2023, p. 23). Predicted impacts of such a rise include severe losses in food yield, fisheries yield, and species (Dasgupta, 2021). Along with increased mortality due to temperature and humidity, this will put the viability of over 3.2bn people at acute risk (IPCC, 2023, p. 5), with global consequences for mass migrations and geopolitical instability.

Just as climate change impacts biodiversity, the opposite is also true. We have already lost over 40% of natural forest, mainly to production of meat and meat foodstuffs (IPBES, 2019), with 10% of global tree cover lost since 2000 alone (World Resources Institute, 2022), exacerbating climate change. Similarly, reductions in ocean biodiversity reduce the effectiveness of the 'marine biological pump' that plays a crucial role in carbon sequestration (Bindoff *et al.*, 2019).

Boundaries on what the planet can stand with without threatening humanity are not restricted to climate change. We are also beyond planetary limits on the health of land, sea and freshwater ecosystems, as well as on land use, air particulates, and soil health (Lade *et al.*, 2020). Ninety-five percent of all mammals by weight are now humans and our livestock (Greenspoon *et al.*, 2023); a third of the remaining wild animal mass come from one species, Baleen whales. These effects interact to threaten region habitability, human health, food supplies, and global security. Some existential threats to humanity have a possibility rather than a probability of occurrence; environmental destruction is the one where we are actually on course for catastrophe. All the social progress the world has made and might make is presently on track to be undone within a few decades.

Yet the technology already fully exists to remedy the situation—and at moderate cost (Dasgupta, 2021; IPCC, 2023). The baton now passes to socioeconomic actors—including service businesses and the scholars who advise them—to reconfigure service ecosystems and societal habits alike around these technologies. Much can still be done to mitigate and reverse many of the effects already seen. A UN report summed this up nicely:

"Economic incentives have generally favored expanding economic activity, and often environmental harm, over conservation or restoration. Incorporating the consideration of the multiple values of ecosystem functions and of nature's contributions to people into economic incentives has, in the economy, been shown to permit better ecological, economic and social outcomes." (IPBES 2019, p14)

Servcollab has recognized climate change as one of most important challenges to be addressed by large-scale service research projects (Fisk *et al.*, 2020). Meanwhile, the Transformative Service Research (TSR) movement has begun to stretch service research beyond the firm's interests to include those of customers and wider society (Anderson *et al.*, 2013). There is an urgent need to incorporate the natural environment in this endeavor. The purpose of this commentary is to review services and related literature that explores SDGs 13, 14, and 15; to develop a framework that integrates the natural environment into service theory; and to propose future research possibilities related to these topics.

The methodology for our literature review followed that outlined in the accompanying special issue editorial (Russell-Bennett *et al.*, 2024). First, a research assistant conducted a search of services journals using selected keywords related to the three relevant SDGs. Second, the authors evaluated the results, and supplemented them by 'snowballing' from these articles' references to other relevant outputs. Third, as service literature on the environmental SDGs is as yet sparse— and particularly so for SDGs 14 and 15—we supplemented these service papers with literature from related fields.

We next review the evolution of service thinking about the natural environment, and SDGs 13 to 15 in particular, before integrating this thinking into a conceptual framework in the following section. Before concluding we propose a research agenda for service and the planet.

The evolving conception of service and nature

A wider interest in the well-being of customers and society has long been present in the service field. This interest has received theoretical boosts from Service-Dominant (S-D) logic's symmetrical treatment of firms, customers and others as cocreating actors (Vargo and Lusch, 2008), as well as from Transformative Service Research and Anderson *et al.*'s (2013) entities-and-outcomes framework as a new lens on value cocreation. While work incorporating well-being still forms a minority of service outputs, it represents one of nine dominant clusters in service research in recent years (Donthu *et al.*, 2022). These authors do not, however, identify any such mature cluster around environmental outcomes. Furthermore, there is a need to correct interactions that are not symmetrical, but rather exploitative (Fisk and Alkire, 2021), such as the ones between humans and their surrounding environment.

Three emergent themes can be tentatively delineated from the modest number of empirical works in service journals that touch environmental issues. The first is consumer-behavior studies examining green behaviors. Notaro and Paletto (2021), for example, analyze consumer motivations towards bio-textiles, while Talwar et al. (2022) study food waste behavior through normative and affective lenses. These form part of the wider sustainable behavioral literature that has been insightfully reviewed by White et al. (2019). A second theme is the analysis of sector impacts. For example, Katircioglu and Katircioglu (2022) estimate carbon impacts on tourism in

Malta. A third theme concerns business models and practices for tackling these impacts, such as Jiao *et al.*'s (2020) proposed strategies to improve electric vehicle take-up.

Far more work studying service contexts and environmental concerns is needed. To develop a distinctive contribution from service scholarship, however, we focus primarily on the evolution of conceptual work. See Table 2 for illustrative studies in service literature, along with parallel developments in other fields.

Environmental resources. A dominant perspective on the environment in both service and wider management literature is as a set of resources. These should be 'stewarded' by firms, which requires firms to develop capabilities to prevent pollution of these resources (Hart and Dowell, 2011). This also leads to initial call for assessment of the environmental impact of services and the need for services to save resources (Grove *et al.*, 1996). According to this 'natural resource-based view,' this stewarding interacts with social as well as financial dimensions of business performance, as it can address people's unmet needs. In a similar vein, Vargo and Lusch (2008) allows environmental resources such as the weather to be integrated—by systems, as well as by individual actors—in order to create value for (individual and collective human) actors. An aim of service ecosystems should therefore be to reduce consumption and exploitation of limited natural resources—as well as to develop resilience to damage to these resources such as climate change (Field *et al.*, 2021). This is aligned with a circular business models perspective that close resource loops and reduce the burden on natural resources (Verleye *et al.*, 2023).

From resources to actors. This resource perspective on nature has great advantages over the

dominant alternative of ignoring nature altogether. However, challenges to this resource perspective come from two directions. First, longstanding psychological and philosophical research has identified varying conceptions of the relationship between humans and the natural world, notably distinguishing a paternalistic stewardship model—broadly consistent with the resource perspective—from a 'new ecological paradigm' that acknowledges humans as one of many interdependent species with a degree of moral equivalence (Cordano, Welcomer and Scherer, 2003). Importantly, the latter, 'ecocentric' view is associated with more environmentally responsible behavior than the former. This appears to be because the former, ultimately anthropocentric perspective tends, when in doubt, to privilege the assumptively superior human species, while undervaluing wildness with all the rich ecosystem services—to humans and others—that it turns out to provide. We might be nice to the pets we steward, but these cats and dogs form as large a proportion of land mammals as do all wild species put together (Greenspoon *et al.*, 2023).

Not that the 'new ecological paradigm' is truly new: it may be relatively novel for post-farming communities, but it appears universal in hunter-gatherer societies (Diamond, 2013). Helkkula and Arnould (2022) analyze this 'animism' philosophy and its relation to the contemporary 'neo-animism,' that shares with animism an axiomatic understanding of humans and other species as equivalent, but that differs in 1) dispensing with the concept of souls for either human or non-humans; 2) conversely, allowing for scientific insights; and 3) accordingly acknowledging that while other animals may be social beings, their society and selves may differ from those of humans. These authors accordingly call for animals and plants to be included as actors in S-D Logic, under a neo-animist philosophy.

Löbler (2017) provides a closely related theoretical analysis of how nature can be incorporated into service theory. He concurs with Helkkula and Arnould (2022) in critiquing the "strong anthropocentrism" of much marketing and service thinking—including that relating to sustainability. He reaches similar conclusions about the need to incorporate non-humans as equal 'entities' who participate in service exchange. He differs in avoiding the term 'actor,' in arguing that 'value' is not appropriate for non-human entities, and in instead redefining service as: "an ongoing process of exchange (transfer) and change (transformation) of resources to reduce or limit rising entropy of a transforming entity" (Löbler, 2017, p. 79). By contrast, Helkkula and Arnould (2022) allow non-humans to co-create value but call for research on how value to non-humans can be recognized and measured.

Ecosystems. The second challenge to the resource perspective relates to the adoption by business researchers of 'ecosystems' as a *metaphor derived from* biological ecosystems. This metaphorical definition is generally taken for granted. In Tsujimoto *et al.*'s (2018) review on ecosystems in management literature, for example, each of the four subfields identified—business ecosystems, platform management, multi-actor networks, and even industrial ecology—implicitly excludes biological or inorganic entities as actors. Where such natural entities are present in the industrial ecology literature these authors review, they form industrial materials subject to mapping and optimization, albeit with sustainability goals, and not actors alongside businesses and other human structures. In a similar vein, Field *et al.* (2021) importantly call the attention of service scholars to "How can service systems be (re)designed to reduce pollution and exploitation of natural resources?", but tacitly assume the service ecosystems they discuss to be separate from the natural

resources they wish to be thus preserved. Likewise, van Heerde *et al.*'s (2021) call for 'ecological value' research turns out to call for research into value for stakeholders, such as customers, marketing managers, policy makers, and societal stakeholders. They write: '"Ecological" is defined by the Oxford Dictionary of English as "related to or concerned with the relation of living organisms to one another and to their physical surroundings." (van Heerde *et al.*, 2021, p. 1). Without any noticeable reflection on the leap of logic, they continue: 'In a marketing context, this means the interactions among and between marketing actors, institutions, and systems.'

However, a minority of environmental and social scientists have questioned whether these ecosystems are truly distinct. From an earth system science perspective, Steffen *et al.* (2020) position human social systems as intertwined with other organic and inorganic components of the 'earth system'. They position businesses as a critical actor and mediator between these systems, producing greenhouse gas emissions, extracting resources, and otherwise impacting nature positively and negatively, while in turn being impacted by climate change and biospheric degradation. For these authors, this is one system. Löbler (2017) concurs: just as service can be transferred between humans, so humans and non-humans can exchange service, as can non-humans with each other. Fisk and Alkire (2021) propose a service ecosystem health metaphor that encompasses private, public and planetary wellbeing, while Fehrer *et al.* (2023) introduce regenerative, waste-free circular service ecosystems. Relatedly, Helkkula and Arnould (2022) include non-human biological entities as actors which participate fully in service exchange, value cocreation and resource integration within dynamic systems.

In the next section, we build on this evolving conception of the role of the natural environment within service ecosystems, to propose an integrated conceptual framework.

Table 2 Illustrative conceptual & review articles

Study	Social & environmental scope (SDGs)				Contribution to this topic
	Social (1-12, 16-17)	Climate (13)	Life in water (14)	Life on land (15)	
SERVICE LITERATURE					
Grove *et al.* (1996)	*	*			Green Services Marketing. Supports the adoption of environmental practices by services providers.
Vargo and Lusch (2008)	*	*			S-D Logic. Environmental resources such as weather are integrated to create value (by human individuals & systems).
Anderson *et al.* (2013)	*				Transformative service research. Service and consumer actors interact to co-create wellbeing outcomes
Löbler (2017)	*	*	*	*	Resource integration and transformation. Non-human actors participate in service, an 'exchange-change process'.
van Heerde *et al.* (2021)	*				Ecological value. Research should produce value to marketing stakeholders, e.g., firms, consumers, policy-makers & societal stakeholders

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Field *et al.* (2021)	*	*		Service ecosystems. Climate change and other environmental challenges affect service ecosystem resilience. Service ecosystems can pollute or degrade natural resources.
Helkkula & Arnould (2022)	*	*	*	*	Neo-animism & S-D logic. All biotic actors, not just humans, co-create value, and can deplete, preserve or replenish natural resources & biological ecosystems.
Bolton (2022)	*	*	*	*	Responsible Research in Business & Management. Its principles—service to society, stakeholder involvement, and impact—frame the contribution marketing scholars can make to SDGs.
Haenlein *et al.* (2022)	*	*	*	*	Responsible Research in Business & Management. Research impact should encapsulate dependent variables for a firm; immediate stakeholders; society; and the planet.
Fehrer *et al.* (2023)	*	*	*	*	Circular Service Ecosystems. Economies operating like natural ecosystems that are regenerative and waste-free.
Verleye *et al.* (2023)	*	*		Circular Business Models. Circular economy engagement as a way to overcome different actors' reluctance to embrace circular business models.

OTHER FIELDS

Hart & Dowell (2011)	*	*		Natural-resource-based view. Firm capabilities can include prevention of pollution, stewarding green resources, and addressing unmet needs of people

Le Blanc (2015)	*	*	*	*	Network analysis. SDGs form a network of targets.
Tsujimoto (2018)	*	*			Ecosystem perspectives. The industrial ecology perspective includes natural resources as actors, and symbiosis as a key concept.
Sachs *et al.* (2019)	*	*	*	*	Transformation perspective. Outlines six systemic SDG transformations, each involving multiple SDGs, around (1) education, (2) health, (3) energy, (4) food, (5) cities, and (6) digital technologies.
Steffen *et al.* (2020)	*	*	*	*	System science. Businesses are a critical actor and mediator between anthropospheric, other biospheric and geospheric systems.
Howard *et al.* (2023)	*	*		*	Multi-level perspective. Health system actors can engender socioeconomic tipping points that decarbonize with health co-benefits.

A conceptual framework for service and the natural environment

We now build upon the interactions, interdependence, and commonality among the three SDGs included in this commentary to develop a conceptual framework to guide thinking and future research on the relation between service and the environment. Key concepts and their definitions are included in Table 3.

The resulting framework, shown in Figure 2, has four notable features. First, it integrates inorganic features of the environment, such as minerals and the climate, as shared resources available for resource integration. Second, it contrasts these sharply from organic life, which it views as actors participating with humans in value co-creation. Third, it draws on biological ecosystem research to view ecosystems not as a biological metaphor but as a biological reality bridging human social structures and non-human actors. Fourth, it thereby derives principles for a spectrum of actor dependencies from parasitism to mutualism.

Table 3. Key Concepts and Definitions

Concept	Definition	Illustrative Reference(s)
Geosphere	The geosphere includes the rocks and minerals on Earth as well as the abiotic (non-living) parts of soils and skeletons of animals that may become fossilized over time.	Steffen *et al.* (2020)

Biosphere	The biosphere includes all life on our planet. Interdisciplinary research combining biochemistry, geochemistry, biology, hydrology, and atmospheric science helps us to better understand the biosphere's role in the Earth system.	
Anthroposphere	The anthroposphere encompasses the total human presence throughout the Earth system including our culture, technology, built environment, and associated activities.	
Symbiosis	The interaction between two dissimilar actors. There are three types described below.	Löbler (2017)
Parasitism	One actor benefits while the other is harmed.	Battistella-Lima *et al.*(2020); Brozovic *et al*. (2015)
Commensalism	One actor benefits while the other neither benefits nor is harmed.	
Mutualism	Each actor in a symbiotic relationship has a net benefit.	

The outer ring of Figure 2 shows the blending of the three environmental SDGs, surrounding an understanding of the natural environment, of which humans are a part. Climate change, life below water, and life on land are intertwined. For instance, climate change has increased run-off of fertilizer applied to farming lands, which has negatively impacted water quality (Calderon, 2021). Inside this ring, our framework shows that the biosphere and the geosphere create the context in which human and non-human actors interact. The anthroposphere, or the human presence, is but a small part of the overall ecosystem of the planet. As stated earlier, human and non-human actors can and should cocreate value not only for themselves but also for all actors represented in the framework; without this, ecosystem health will suffer to the detriment of all actors, including humans. A first step towards such mutual value creation is to move from parasitic relationships to commensalism (see Table 3 for definitions). As all biospherical actors require regeneration, however, mutualistic relationships among human and non-human actors are ultimately needed to

create sustainable strategies. Sociologically, this implies a shifting of human perspectives from being stewards of the environment to being students of the environment.

There is much humans can learn from the natural environment in order to inform service design, delivery, and management. For instance, service research has utilized the term "ecosystem" without explicitly including the term's many components. For example, coral reefs have three zones: an inner reef, a reef crest, and an outer reef (Henkel, 2010). The physical and ecological characteristics and function of each zone is different, and the inhabitants of each zone vary. However, each zone affects the overall health of the others, and offers benefits to the others. Service research can be informed by this knowledge, particularly when analyzing micro, meso, and macro levels of a service ecosystem, which can integrate biospheric actors as well as geospheric shared resources. On land, mycorrhizal fungi occupy a significant role in connecting trees of various species and help them share resources and nutrients (Bonfante and Anca, 2009). The extent and role of these fungi have yet to be fully explored and understood. What is emerging, however, is the realization that forests are active "webs of interdependence, linked by a system of underground channels, where they perceive and connect and relate with an ancient intricacy and wisdom that can no longer be denied" (Simard, 2021, p. 4). A naïve resource view might entirely fail to capture these crucial interdependencies between non-human actors, which in turn impact on the ecosystem services they provide and the service they need in exchange.

The takeaway here is that, as we become better students of nature, we realize that simply being a steward of nature is an insufficient state. We must become true partners with other species if we are to survive and thrive in the future. The way forward is to learn from nature in order to better

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design services and service ecosystems through biomimicry and bioinspiration. This approach has been demonstrated by service organizations in the past, and has been shown to help businesses not only *do better*, but to *be better* (Farnsworth, 2020). In this way, organizations can find a path from parasitism through commensalism to mutualism.

Armed with such a symmetrical view of human and non-human actors, service research is well positioned to provide unique insights into sustainable development. However, this cannot happen unless we internalize such an expanded view of the remit of service. The natural environment, and the SDGs that concern it, are not a special topic that some may choose to flirt with. They are our bedrock, our food, and the air we breathe. Ecosystems are not a metaphor. They are where we live, research, teach and serve. We need to approach these issues with a sense of respect rather than hubris: What can we learn from nature that will serve us better? How can we partner with non-human actors to better serve the planet, its environment, and humanity?

Figure 2 – Weaving the Natural Environment into Human Service: Conceptual Framework
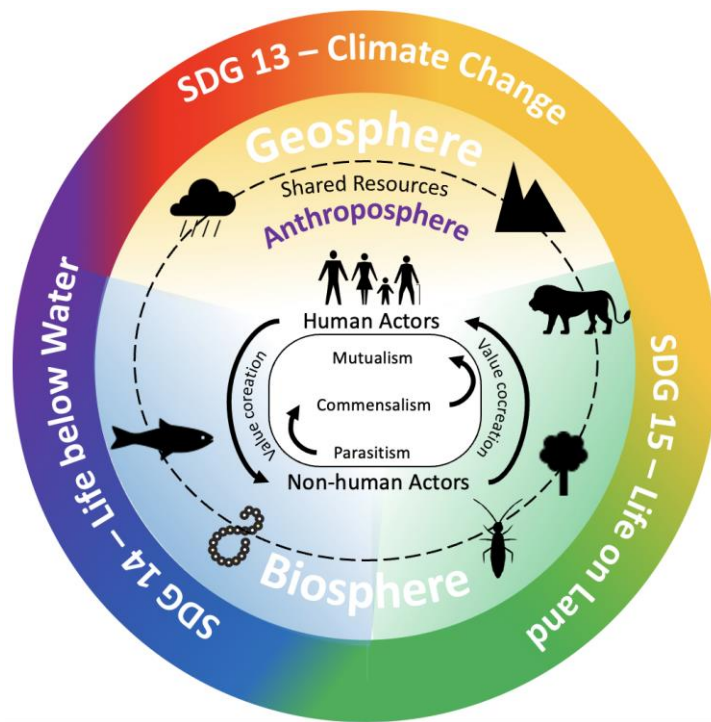
Towards a research agenda for service and the planet

Our conceptual framework has profound implications for service research and opens rich future research avenues. We structure these research opportunities across three levels: micro/actor,

meso/community, and macro/ecosystem. Suggested research questions for each of these levels are presented in Table 4.

First, the conceptual framework highlights the need to look beyond the anthroposphere and frame service research as part of a broader context that includes the biosphere (SDG#14 and #15) and the geosphere (SDG#13). As such, at the micro level, this emphasizes the need to expand the range of actors we include in service research to include not just humans and our social structures but also non-human species and networks. Although theoretical foundations of service research, such as S-D Logic, already see humans as part of the natural environment (Vargo and Lusch, 2017; Vargo, 2018), there is a lack of service research that takes into consideration non-human actors (Helkkula and Arnould, 2022). By symmetrically integrating human and non-human actors, our conceptual framework challenges the human-centricity of service research. Service theory and its applications such as service design and service innovation have prided themselves, and understandably so, on their human-centricity as opposed to firm-centricity (Patrício, Gustafsson and Fisk, 2018). However, integrating the complete biosphere as cocreators of value requires a reinterpretation of service research frameworks, raising numerous future research avenues, as illustrated in Table 4.

Second, at the meso or community level, framing service research as part of the biosphere and geosphere requires reaching out to other research communities. While service research is already viewed as an open, multidisciplinary, and even transdisciplinary research field (Gustafsson *et al.*, 2016) encompassing more than 24 disciplines (Spohrer, Kwan and Fisk, 2014), it is firmly rooted in the anthroposphere, and should embrace and learn from research fields such as ecology, biology,

zoology, and earth, environmental, and climate sciences, among others. An especially impactful collaboration might be on identifying service-related tipping points—that is, abrupt, irreversible systemic changes (Milkoreit *et al.*, 2018)—and contributing to tipping interventions, a contagious spread of new behaviors, social norms and structural reorganizations (naturally among non-human as well as human actors) that can decisively address climate and other environmental challenges (Howard *et al.*, 2023). This effort can also include contributions to SDG transformations of land health, water health and food systems (Sachs *et al.*, 2019). The meso level can also include adapting current contributions emerging in service research to the specific challenges posed by SDGs 13, 14 and 15. For example, current work in Transformative Service Research on human actors experiencing vulnerability might be extended to non-human actors experiencing vulnerability (Black and Gallan, 2015; Battistella-Lima, Veludo-de-Oliveira and Barki, 2020; Boenigk *et al.*, 2021; Gallan and Helkkula, 2022).

Third, at the macro or ecosystem level, by introducing the three types of symbiosis, namely parasitism, commensalism, and mutualism, our conceptual framework learns from natural ecosystems about how service systems can cocreate value. Service research has been focusing on service ecosystems as relatively self-contained, self-adjusting systems of resource-integrating actors (Lusch and Vargo, 2006). These rarely acknowledge any aspect of the bio- or geosphere. This may implicitly perpetuate a parasitism mindset that sees non-human actors as resources to be exploited by humans. Merely reducing this exploitation will only slow its catastrophic effects. Efforts to advance service research towards mutualistic value cocreation are already under way with important calls to action from different complementary perspectives: sustainable marketing (Löbler, 2017), sustainable consumption (Field *et al.*, 2021; Bolton, 2022), transformative

consumer research (Mende and Scott, 2021) and transformative service research (Fisk and Alkire, 2021; Alkire *et al.*, 2022; Larivière and Smit, 2022). However, this might not be enough. For example, sustainable consumption can be defined as "consumption that supports the ability of current and future generations to meet their needs without causing irreversible damage to the environment or to the functioning of ecological and social systems while improving stakeholder well-being and efficiency" (Bolton, 2022, p. 109). This means that, although these aspirations are a significant step forward, they are still not yet symmetrically integrating human and non-human actors, being akin to a commensalism perspective. In this case, we care about the natural environment to continue to draw resources from it, albeit at a sustainable rate. This mindset undervalues ecosystem services, defined as the benefits people obtain from ecosystems of plant, animal, and microorganism communities and the nonliving environment, including humans (Alcamo *et al.*, 2003). These services include food, water, flood and disease control, as well as spiritual, recreational, and cultural benefits. As human actors cannot live without ecosystem services, while non-human actors could very well survive without service ecosystems (Löbler, 2017), there have been attempts to align the understanding of service ecosystems with ecosystem services (Matthies *et al.*, 2016). In a few parts of the world, waterways have won legal personhood, with the right "to flow, to be free from pollution, to fulfil its ecosystem's essential functions" (Gies, 2022).

There is ample opportunity to explore future research opportunities to move service research from parasitism towards mutualism (Helkkula and Arnould, 2022). Fortunately, several transformative service initiatives are already trying to tip the relationship between human and non-human actors towards mutualism. International initiatives include the Forest Stewardship Council, which

provides sustainable forestry certification services covering responsible sourcing, conservation and restoration (FSC, 2023). Local initiatives such as Montis (2023) use crowdsourcing to fund the acquisition, management and restoration of Portuguese forests, disseminating good practices, training landowners and organizing volunteer work. The Mother Tree Project (2023) is an example of a recent project, breaking ground for mutualistic value cocreation and restoration of forests by studying how large hub trees (the "mother trees") share resources with their seedlings. Learning from these mother trees will greatly leverage the management and restoration of forest habitats. Commercial enterprises such as 4Ocean, which works to remove plastics from the water, have shown promise: They now offer a program to offset your footprint of the plastics you can't avoid by removing an equal amount of plastic waste from the world's oceans, rivers, and coastlines (4ocean, 2023).

Table 4 – Future Research Questions

Research questions	Related Literature
Micro / Actor (human and non-human)	
What are the implications of symmetrically integrating humans and non-humans in service research?	Helkkula and Arnould (2022), Löbler (2017)
Which non-human actors should be studied and how can we study them?	
What is the nature of human and non-human value cocreating interactions? How can 'value' best be conceived to apply to such a range of actors?	
Meso / Community	
Which research fields focused on the biosphere and geosphere can help service research and how? How can service research develop transdisciplinary research collaboration with fields focused on the biosphere and geosphere?	

How can service research contribute to positive social tipping interventions that cause abrupt, irreversible systemic change?	Howard et al. (2023), (Otto *et al.*, 2020)
How can we identify desirable service-related positive tipping points and help trigger them?	
How can service research contribute to the transformations needed to accomplish Service Research Theme 6?	Sachs et al. (2019)
How can we adapt transformative service research on human actors experiencing vulnerability to non-human actors experiencing vulnerability?	Black and Gallan (2015), Battistella-Lima, Veludo-de-Oliveira and Barki (2020), Boenigk *et al.* (2021), Gallan and Helkkula (2022)
Macro / Ecosystem	
How can service ecosystems foster ecosystem services?	Matthies *et al.* (2016)
How can we adapt environmental impact assessment tools to service research? How can we (re)design and implement low, net zero or, desirably, negative environmental impact services?	Sierra-Pérez *et al.* (2021), Howard *et al.* (2023)
How can service research help to develop collaborations at the planetary level and systematic service innovations to improve ecosystems (human and non—human) health?	Fisk and Alkire (2021)
How can we move current service research initiatives akin to commensalism to a mutualistic co-creation of value with non-human actors?	Bolton (2022), Field *et al.* (2021) , Löbler (2017)

Conclusion

This commentary highlights the need to break free from an anthropocentric research perspective and see the human-made environment (anthroposphere) as intertwined with other living organisms (biosphere), and the geological, hydrological, and atmospheric environment (geosphere). All other anthropocentric SDGs are unattainable if we do not equally create value for the natural environment: the anthroposphere cannot survive without the biosphere and geosphere. On the other hand, the biosphere and the geosphere could thrive without the anthroposphere.

This commentary therefore emphasizes that service researchers need to adopt (1) a new set of actors, (2) a new role, and (3) a new goal. First, following the call of Helkkula and Arnould (2022), service scholars need to recognize the biosphere not as a resource to be exploited but a set of non-human actors that cocreate value with human actors. Second, service researchers should reconceive our role not as stewards of nature, taking care of an ultimately subsidiary biosphere and geosphere, but one where we are students of nature, learning from earth, environmental and climate sciences. With this new role, similarly to Simard's (2021) wisdom of the forest, service researchers can elevate the wisdom of human society by weaving the environmental SDGs with service ecosystems. Third, although service research implicitly or explicitly recognizes the current situation of parasitism, it can easily get mired in a perspective akin to commensalism. To enable human and non-human actors alike to flourish, service scholars and practitioners should aim to foster mutualistic value cocreation, thus helping both humans and our surrounding biosphere and geosphere towards a greater service ecosystem health (Fisk and Alkire, 2021; Alkire *et al.*, 2022).

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