

A pragmatist ecological economics - Normative foundations and a framework for actionable knowledge

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ARTICLE INFO

Keywords:

Pragmatist philosophy
Epistemology
Human-nature relationships
Social-ecological systems
Paradigm
Methodological pluralism
Actionable sustainability

ABSTRACT

Ecological economics envisions problem-solving collaborative efforts characterized by disciplinary diversity and participants within and outside of research professions. Pursuit of its ambitious vision has led to ambiguity in terms of ecological economics' paradigms, methodology, and subject matter. There remains a need for comprehensive methodologies and for nuanced discussions of methodological pluralism and action-oriented research practice. We present a pragmatist ecological economics as one foundation to practicing ecological economics. We synthesize the basic normative assumptions of a pragmatist philosophy with the foundational goals of ecological economics. This synthesis provides potential researchers with foundations including a basic scientific worldview, a topical focus on a quasi-distinct portion of human-nature relationships, two broad burning questions, a basic menu of methods, and action-oriented goals for applying ecological economics in practice. Methodological pluralism is embraced, and conflicting normative assumptions are reconciled with the recognition that singular inquiries provide incomplete or partial knowledge, not competing knowledge. By integrating into applied contexts, in large part by building relationships with practitioners and the diverse publics, we suggest that there is opportunity to co-develop processes and forums that at least can help us understand one another better on our collective effort toward sustainability.

1. Introduction

Ecological economics (EE), a transdisciplinary and interdisciplinary field broadly focused on issues of sustainability, aims to engage in problem-oriented science that directly addresses on-the-ground environmental issues. Howarth (2008) stressed that EE has an overarching goal to inform decisions, balance competing values, and draw on insights from a variety of intellectual traditions.

Despite the promise and appeal of EE, the field has developed in a way that has led to ambiguity, both in terms of its subject matter and its methodology. With regard to the former, Röpke (2005) noted that "it is a difficult, if not impossible task to identify the main topics and research programmes of ecological economics...the field could be said to cover almost anything with a faint relation to the environment." Similarly, Spash (2015:32) asserted that the body of literature in EE is "amorphous." These critiques are justified when considering scholarship focused on establishing the bounds of the subject matter of EE. For instance, Röpke (2005) listed three main research programs: (1) identity formation (a great deal of which included distinguishing EE from

environmental and resource economics); (2) issues of scale and the resilience approach and; (3) valuation and decision-making. And Castro e Silva and Teixeira (2011) listed ten topic areas: (1) theory building; (2) methodological issues; (3) values; (4) policies, governance, and institutions; (5) technical change and the environment; (6) trade and the environment; (7) global environmental issues; (8) production, consumption and sustainability; (9) biodiversity conservation and; (10) valuation.

Regarding methodology, there is limited focus on the philosophical and theoretical foundations of EE, which impedes progress in the field and calls into question the scientific integrity of research conducted within its purview (Baumgärtner et al., 2008; Puller and Smith, 2017; Spash, 2013; Anderson and M'Gonigle, 2012). Anderson and M'Gonigle (2012) questioned the future of EE given, in part, its incoherence. That is, a lack of clarity about the field's foundations have led to "a situation of ambivalences and contradictions" (Puller and Smith, 2017:19) and a "precarious and epistemologically confused position" (Spash, 2012:37).

The core of these critiques implies that the progress and coherence of EE, and ultimately its relevance, depends on more scholarship related to

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its scientific foundations. Indeed, such foundational discussions, and methodological pluralism in particular, are said to be an important focus for the next 30 years of EE (Farley and Kish, 2021). Strong scientific foundations can lead to a stronger disciplinary identity, more confident scientists working within challenging transdisciplinary and interdisciplinary hybrid disciplines (e.g., ecological economics, human ecology, conservation biology), and clear criteria for evaluating methodological approaches.

Within EE, theoretical frameworks have been limited. Those advocating critical realism provide perhaps the most comprehensive foundation (eg. Puller and Smith, 2017; Spash, 2015), with other proposals including some form of social constructivism (Baumgärtner et al., 2008; Goeminne, 2011; Tacconi, 1998), the phenomenological (or interpretivist) approach (Ramos-Martin, 2003), American pragmatism in the form articulated by Bromley (2008) and in post-normal science (Funtowicz and Ravetz, 1993; Munda, 1997). In large part, foundational discussions in EE (e.g., Baumgärtner et al., 2008; Söderbaum, 2008; Dow, 2004; Puller and Smith, 2017; Spash, 2015; Levrel and Martinet, 2021; Spash, 2012, 2020, 2021) are challenging to parse because a framework for the discussion is often missing or underdeveloped. For instance, even the most attentive reader may feel lost when considering foundational ideas such as the call for structured methodological pluralism with matching epistemologies and ontologies (Spash, 2012), the practice of art within EE (Herrmann-Pillath, 2020), the engagement with practitioners as transdisciplinary (Batker, 2020), and participatory planning as an alternative to markets (Akbulut and Adaman, 2020).

We aim to contribute to EE with a proposed general methodology for a pragmatist ecological economics, with the help of a ‘scientific macrostructure’ framework. The pragmatist ecological economics presented herein emerged from our experiences over a decade of attempting to integrate research into management and planning processes on public lands in the United States. Specifically, we participated as researchers within a variety of processes, embedded within a particular social-ecological context, including a specific planning issue (e.g., national forest planning, wild and scenic river planning) and its associated governance institutions (both formal and informal), as well as a place and its people.

As researchers engaged with planners, managers, and members of the public, it became clear that our efforts were most integral to facilitating a social process among the diverse parties involved. The social process, supported by our applied science efforts focused on people’s relationship with the place and its environment, constituted the development of actionable knowledge. Actionable knowledge recognizes that scientific evidence in the absence of interpersonal relationships and social contexts is inadequate for producing action (Levin, 2013; Stern, 2018). Actionable knowledge is considered a social enterprise that is facilitated by effective ‘learning spaces’ whereby meanings and values can be discussed and negotiated (Stern et al., 2021). We suggest that pragmatist philosophy provides a foundation for an ecological economic methodology that can, fundamentally, facilitate social processes focused on developing actionable knowledge by centering people’s relationship with the environment. It is a methodology for applied contexts where, as Batker (2020) noted, theoretical insights can emerge from such practice.

2. A scientific macrostructure and ecological economics place within it

Patterson and Williams (1998:284) defined science as a “systematic set of empirical activities for constructing, representing, and analyzing knowledge about phenomena being studied” which are guided by normative philosophical commitments. Assessing scientific practice is facilitated by considering the scientific ‘macrostructure’ (Anderson, 1986), and we adopt and adapt the framework developed by Patterson and Williams (1998) with its three different levels: i) worldviews, ii) paradigms, and iii) research programs.

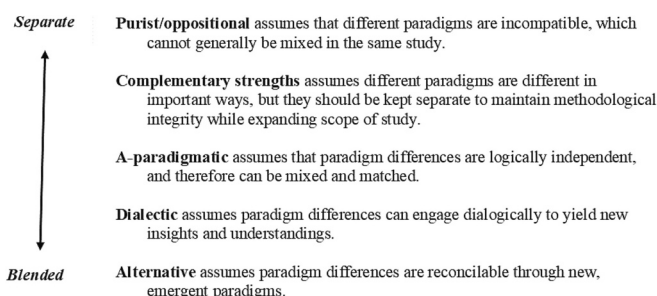


Fig. 1. Dialogs and views on the interaction of different paradigms.

2.1. Worldviews

Worldviews are the broadest and most general level of the scientific macrostructure. The pragmatist worldview embraces multiple approaches to science with any one paradigm providing only a partial understanding of the phenomenon of interest. These partial understandings are not necessarily mutually exclusive. Indeed, it is the interaction of those diverse interests and epistemological communities in a dialog (or not) that can plot the worldview on a spectrum from separate through blended, as seen in Fig. 1. The pragmatist worldview to science is described as “dialectic”, which Norton (2005:572) describes as an open-ended process without “having a single, ideal endpoint.”

Within EE, discussions of worldviews are both foundational and prevalent. Indeed, Howarth (2008:469) suggested the field is defined “by a set of concrete problems rather than a particular epistemology or methodology.” Since its inception, EE has seen many calls for **methodological pluralism** (e.g., Costanza, 1991; Gowdy and Erickson, 2005; Norgaard, 1989). However, as Spash (2015:33) stated: “the conundrum for methodological pluralists is that they must either indiscriminately accept everything, and so lose any meaning for the concept of knowledge, or accept some grounds for rejecting ideas and approaches which they find strongly objectionable.” And the challenge in such pluralism will be the sorting of good knowledge from bad knowledge (Baumgärtner et al., 2008; Spash, 2012), and the avoidance of an ‘anything goes’ approach where science is practiced on a tenuous theoretical foundation (Dow, 2007; Spash, 2015). As a result, Spash (2012) embraces a methodological pluralism where common epistemological and ontological commitments of the different methodologies are shared.

2.2. Paradigms

Paradigms or normative philosophical commitments shape the way research is conducted (Patterson and Williams, 2005); such interrelated, mutually defining and constraining assumptions include ontological, epistemological, and axiological assumptions (Laudan, 1984).

2.2.1. Pragmatist ontology: a contextual and limited reality

Ontological assumptions are notions about what exists in the world, and the nature of reality, human experience, and social beings. Ontologies can be mapped from realism to relativism, or alternatively objectivism to constructivism. A strong realist would suggest that one reality exists, that the social and natural world are both concrete and fixed and that they can be observed and explained in terms of accuracy. A strong relativist would suggest that multiple realities exist, perhaps one reality for each person, since phenomena become reality through the mind and its processes and our observations of these realities are mutable, contextual and emergent (Evely et al., 2008; Moon and Blackman, 2014; Morgan and Smircich, 1980).

According to Norton (2005:63), pragmatism is “not relativistic—it expects to arrive at a justifiable decision in a particular situation—so it is better thought of as contextual.” Additionally, pragmatism is not strictly

realist in that it strongly rejects ‘foundationalism’, or the idea that knowledge is grounded in basic beliefs about a certain reality (Minteer, 2012). Anderson (2011) suggested that pragmatists do not believe in an absolute truth at a given time but, instead, a temporary belief that will inevitably change. Thinking of reality within pragmatism as ‘contextual’ underscores that our experiences, social commitments, opinions about what is important, and general viewpoints are diverse and, inevitably, shaped by different circumstances. This does not mean that there is no knowledge outside the human mind, but instead (applying the popular analogy of Charles Peirce) that knowledge is like a cable made up of individual strands (i.e., beliefs) where the breakage of one strand does not necessarily weaken the cable as a whole (Peirce, 1868; Webb, 2007). This signals the idea of a tentative truth, which does not commit with certainty or a capital “T” truth.

2.2.2. Pragmatist epistemology: experience creates knowledge, wary assessment confirms it (for the moment)

Epistemology is concerned with validity and what constitutes a claim to ‘truth’. It is characterized as assumptions of how knowledge is acquired and generated, what is knowable, who can know, and the relationship between the researcher and the subject (Hudson and Ozanne, 1988). Epistemology is often seen along an objective-subjective continuum, where a strong objectivist (sometimes positivist) considers that a singular truth exists that can be verified with observation and empirical evidence; whereas a strong subjectivist (sometimes ‘constructivist’ or ‘interpretivist’) considers knowledge of the world to be inherently influenced by one’s experience (Durning, 1999; Moon and Blackman, 2014). A strong objectivity sees the researcher as detached and separate from the phenomenon observed, while a strong subjectivist considers a “fusion of horizons”, where the observer is always, necessarily, intertwined with the observed phenomena and, thus, call for greater reflexivity and positionality in social science.

Pragmatist knowledge claims are developed and verified through

repetitive observation and experimentation related to diverse human experience, at both the individual and community level (Minteer, 2012; Norton, 2005). The empiricism (i.e., the notion that experience is central to creating knowledge) embraced by pragmatists is different from classical empiricism that reduced experience to a mechanistic occurrence (Hildebrand, 2011; Webb, 2007). Dewey thought that an atomized and mechanistic view of experience could never account for the diversity of lived meanings in the sociocultural environment, which informed his view that the mind was more social than isolated, and shaped largely by natural and cultural environments (Hildebrand and Zalta, 2018). The interactive nature of humans within diverse environments implies that “each learner is a living organism with her own history, needs, desires, and, perhaps most importantly, her own interests” (Hickman, 2009:9).

The commitment to experience and learning aligns with the pragmatist commitment to ‘anti-foundationalism’, or the belief that there is no certain knowledge serving as the foundation of inquiry (i.e., pragmatism does not begin with theoretical starting points or pre-suppositions) (Haack, 2009; Webb, 2007). As articulated by Friedrichs and Kratochwil (2009:714), “instead of relying on false promises, we will learn to act on reasonable bets.” Knowledge is inherently tentative, and pragmatist epistemology implies open-mindedness and humility.

The process for assessing knowledge claims is democratic, where “community experience” (Norton, 2007:305) or “public critical discussion” (Bernstein, 1989:9) are the arbiters of good and bad knowledge. Evaluating knowledge claims requires wary assessment, or an understanding of both the immediate elements of the experience (i.e., the interaction with the real world) and the background information influencing one’s experience (Hildebrand, 2011). Wary assessment combined with the belief in the diversity of human experience that accommodates another fundamental commitment of pragmatism—pluralism.

The embrace of pluralism, whether it be a plurality of ethical stances and values or a plurality of approaches to scientific inquiry, stems partly from the normative commitment that science and democracy should be

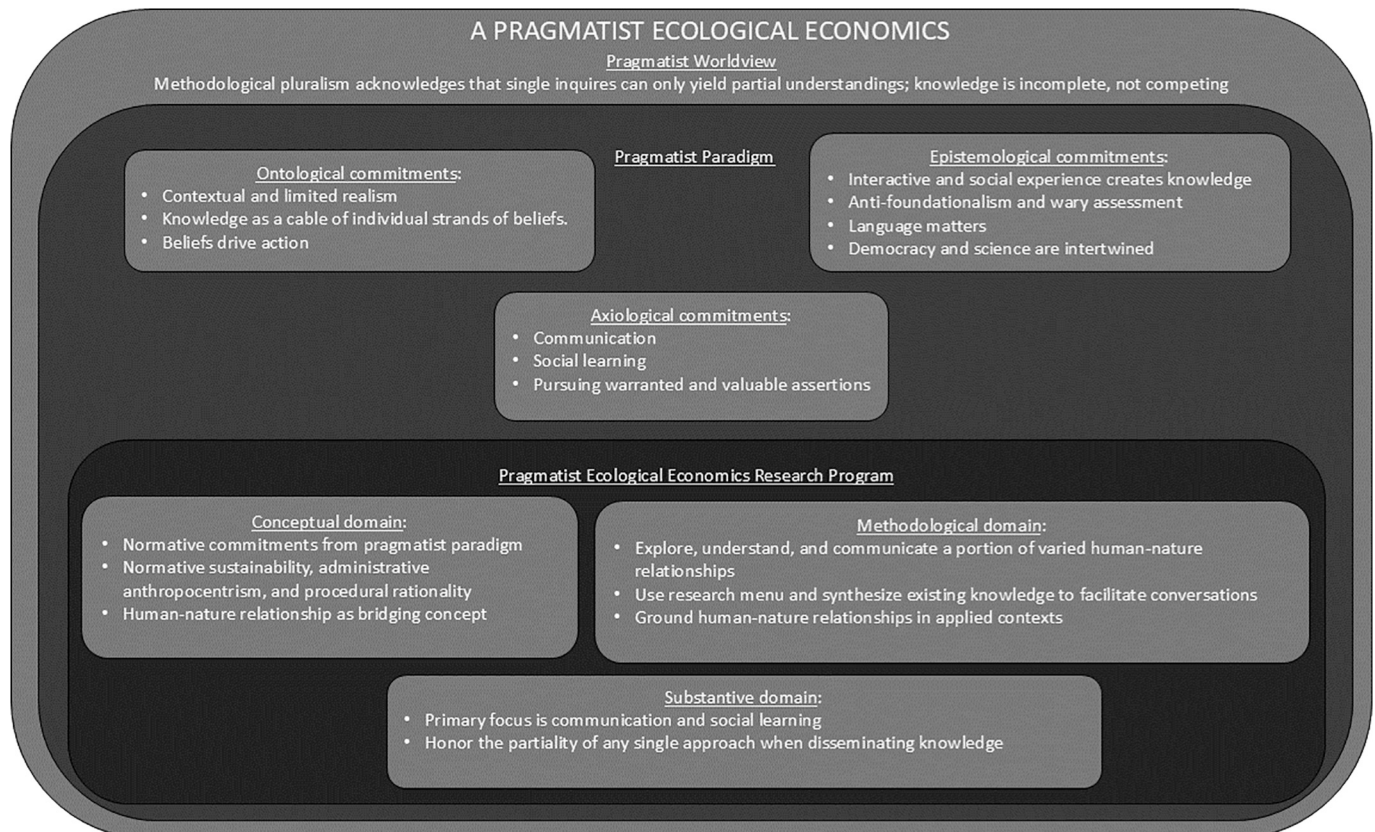


Fig. 2. The scientific macrostructure of a pragmatist ecological economics.

closely related. While this commitment to pluralism may appear to be relativistic, its adherence to community deliberation to sort good knowledge from bad knowledge should yield some level of consensus, or at least shared understanding. In other words, pragmatists do not suggest that all ideas are equally valid. Even though full consensus may not be found, one would expect that a manageable number of warranted beliefs would emerge through public debate and deliberation.

The final element of pragmatist epistemology to be discussed is, as Minteer (2012:10) phrased it, a commitment to a “linguistic emphasis on community.” This commitment refers to the importance of language for understanding diverse experiences and, consequently, knowledge. Norton (2005:563) noted that a ‘truly’ pragmatic approach is one that “pays attention to the uses of language in real, communicative situations”, and places “more emphasis on the use of language for purposes other than to describe the world; more attention would be given to language that evokes attitudes, persuades others, enters into commitments, and builds trust.”

2.2.3. Pragmatist axiology: communication, social-learning, and addressing the myriad practical problems of life

Axiology refers to the goals and objectives of research, reflecting ethical and value commitments. Axiological assumptions can be categorized as ‘terminal goals’ such as prediction, explanation, description, understanding and ‘instrumental goals’ such as generalizability, persuasiveness, insightfulness, and reliability (Hudson and Ozanne, 1988). Axiology focuses less on truth (which is more the realm of epistemology) and more on important outcomes of the research. Ecological economics has the dual aims of understanding and explaining the world, and influencing action based on an idea of how the world ought to be (Baumgärtner et al., 2008).

With an embrace of methodological pluralism (Westbrook, 1993), a pragmatist approach might employ methods aiming to predict, understand, explain, or describe. While pragmatism embraces pluralism in methodology, the primary axiological terminal goal could be considered as communication and social learning. In the face of challenging problems, particularly those plaguing the public, Dewey (1927:155, *emphasis added*) suggested that the solution is “perfecting of the means and ways of *communication of meanings* so that genuinely shared interest in the consequences of *interdependent activities* may inform desire and effort and thereby direct action.” Pragmatism has the purpose of getting to cooperative action and accelerated learning (Norton, 2007). Given the terminal goals of communication and social learning, the instrumental goals of persuasiveness and insightfulness are useful criteria for evaluating scientific knowledge.

2.3. Research programs

While worldviews and paradigms are not discipline-specific, research programs are. Patterson and Williams (1998) identify research programs as the third substantive component of any research endeavor, comprising (1) the conceptual domain, which includes normative commitments discussed above but also the theoretical concepts (or core ideas); (2) the methodological domain, including approaches to research design, sampling, data analysis and interpretation and (3) the substantive domain, including the applied or managerial problems of interest (or burning questions, (Patton, 2002)).

3. A pragmatist ecological economics

We now build on these normative commitments to illustrate a pragmatist EE (Fig. 2) and discuss the conceptual, methodological, and substantive domains of a pragmatist EE research program in turn. Our purpose is to continue to illustrate the distinctive characteristics of a pragmatist ecological economics and how it might be operationalized.

3.1. Conceptual domain

Environmental pragmatism adopts normative sustainability, which differs from a ‘descriptive’ sustainability that dictates, a priori, what should be measured (e.g., all relevant forms of capital (Neumayer, 2013)). Normative sustainability holds that choosing what to sustain happens prior to devising a way to measure it (Norton, 2005), which allows evolving communities to specify the meaning of sustainability for their own community (Norton, 2015). Norton (2015:104, *emphasis added*) defined normative sustainability as follows: “for a given generation to live sustainably means that that generation fulfills its needs and desires so as not to destroy important and valued *opportunities* for future generations.”

Defining ‘opportunities’ requires a pluralistic approach to the ways that humans relate to, or connect with, nature. Indeed, we suggest embracing the concept and language of human-nature relationships. The use of the word ‘relationships’ is deliberate, as it acknowledges a reciprocity that is important to EE, and it is sufficiently broad and inclusive as an introductory term for facilitating conversations and productive discourse in applied contexts. The idea of human-nature relationships is nebulous (Dvorak et al., 2013), and we root the term in ecological economics by focusing largely on values, meanings, preferences, benefits, ecosystem services, connections, or natures contributions to people (Borrie and Armatas, 2022; Díaz et al., 2018; Hein et al., 2006; Ives et al., 2018; Pascual et al., 2023; Williams, 2014a). These ideas (e.g., connections, values) have been discussed at length, and there is considerable overlap and interrelation; they may include ‘meanings’ ranging from identity-expressive to instrumental and inherent (Williams, 2014a), ‘connections’ from philosophical to material (Ives et al., 2018), ‘ecosystem services’ from cultural to production (Hein et al., 2006), or ‘values’ from prosperity and belonging to stewardship and harmony (Pascual et al., 2023).

No particular framing or framework is authoritative, but instead there may be benefits to incorporating some or all the ideas in applied contexts. In essence, we are suggesting a focus on a more inclusive, descriptive, and perhaps emotive version of both the concept of ‘utility’ and the goods and services from which utility is derived. Carrying the analogy of human-nature relationships and neoclassical-economic concepts too far is contrary to the spirit and practice of methodological pluralism and EE. But the primary point to convey is that the EE herein targets the touchpoint between people and the opportunities provided by natural systems. Exactly how that touchpoint is framed or conceptualized is determined in specific applied contexts.

Flint et al. (2013:215) were reluctant to include ecosystem services as a ‘type’ of human-nature relationship, and suggested that the concept only covers “a narrow segment of the broad human-nature relationship spectrum.” We would avoid the idea that there are types of human-nature relationships along a spectrum, but instead think about human-nature relationships as a sea urchin with spines – where each spine is a different element of our individual relationships. We suggest that the portion of spines of the human-nature relationship investigated by the EE pertains to discussions of values, preferences, benefits, ecosystem services, connections, or natures contributions to people; it is that focus which makes our approach *ecological economics*, and not another transdisciplinary hybrid approach focused on human-nature relationships.

For instance, human ecology with roots in sociology might aim to understand how humans and non-humans compete, cooperate, behave, and organize, and the implications of such interactions on both humans and the environment (Catton, 1994). Conservation biology partly seeks to understand how human activities influence, usually negatively, the biology of species, communities, and ecosystems (Soulé, 1985). Political ecology may explore social and environmental change through a political lens, often with a focus on governance institutions; fundamentally, the hybrid discipline eschews the idea that social and environmental change are apolitical (Robbins, 2012). We temper our assertions of what defines other hybrid disciplines because they generally face similar

Box 1

Burning questions of a pragmatist ecological economics.

- (1) What comprises the varied portion of human-nature relationships pertaining to values, connections, preferences, benefits, ecosystem services, or natures contributions to people?
- (2) How can this portion of human-nature relationships be effectively communicated and discussed to further productive discourse in applied contexts?

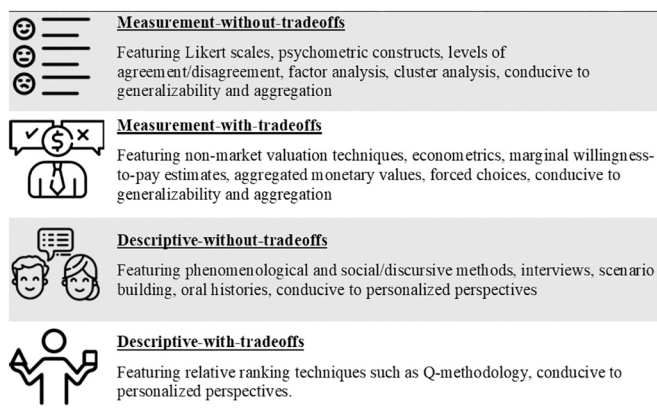


Fig. 3. A research menu: different approaches to partially understand human-nature relationships.

challenges to EE, with internal debates about how to define their respective fields with clarity and coherence. Nonetheless, most hybrid disciplines focus on a quasi-distinct portion of spines of the human-nature relationship.

While the conservation sciences community has learned much about how humans relate to nature, each field is only capturing a portion of that relationship. We suggest that human-nature relationships can act as a bridging concept among the varied conservation sciences, with some inevitable overlap in the questions (and results) of inquiries across fields. While most transdisciplinary hybrid disciplines only address a portion of the human-nature relationship, it is also true that any single inquiry within a particular field will only yield a partial (or incomplete) understanding of a portion of the human-nature relationship. Herein, a single inquiry will only provide a partial understanding of an individual's complex array of values, preferences, benefits, ecosystem services, or natures contributions. A plurality of approaches is thus needed to yield a more comprehensive understanding of the portion of the human-nature relationship that is of focus in EE. And as discussed in Section 4.4, we believe that it is only through the earnest and thorough consideration of the diversity of human-nature relationships that normative commitments of sustainability can be widely understood and actioned in applied contexts.

3.2. Methodological domain

A pragmatist EE focuses on two burning questions (Box 1). Data collection and measurement is broadly defined, and generally any structured approach to knowledge development could be deployed. We propose a 'research menu' (Fig. 3) not as an exhaustive accounting of all approaches, but instead to stimulate thought by providing an accessible overview of types of approaches that can support understanding human-nature relationships in applied contexts. The research menu acknowledges that method choice will have implications for what part of the human-nature relationship story is told. We make two main distinctions in the research menu:

- **Measurement versus description:** Williams (2014b) makes the distinction between approaches focused on quantifying the strength of bonds to nature (measurement), and primarily qualitative approaches focused on characterizing experiences and meanings of nature (description). Those approaches focused on measurement are likely to be relatively more reductive in how values, preferences, and connections to nature are framed, as they need to be established prior to the actual measurement (i.e., a respondent is constrained by the data collection instrument). Differently, descriptive approaches are often more free flowing with respondents often articulating their individual perspectives at length. Approaches that measure connections to nature are more conducive to generalizing to a broader population (and thus aggregation), whereas approaches focused on description can provide more personalized perspectives.
- **With-tradeoffs versus without-tradeoffs:** We distinguish between methods that force (or do not force) people to consider tradeoffs for two reasons. First, understanding tradeoffs is a critical focus of ecological economics, as it acknowledges planetary limits and the limits of growth, and at a more micro-level it acknowledges that our choices have both opportunity costs and potential implications for others (our human-nature relationships may conflict). Second, as a transdisciplinary approach, researchers work with both decision-makers and other stakeholders, and methods that force tradeoffs can facilitate important conversations about what opportunities a given community may want to prioritize; after all, wicked problems (Rittel and Webber, 1973) are the focus, and there is no single correct answer.

A pragmatist EE works in applied contexts (e.g., broad-scale planning, project level decision-making), where insights related to the second burning question (Box 1) can emerge; within these arenas one is in the substantive domain.

3.3. Substantive domain

The substantive domain of the researcher program is where "science links directly with substantive (real world or managerial) problems" (Patterson and Williams, 1998:290). A pragmatist EE researcher in the early stages of the research cycle (i.e., problem definition, method selection and design) looks to engage non-researchers on how different types of methods can both facilitate an understanding of human-nature relationships and provide support to addressing the real-world issue at hand (e.g., forest planning). In the latter stages of the research cycle (i.e., dissemination), the research menu could help to ensure that whatever partial understanding is being presented is contextualized within the bigger picture. Such contextualization is important, as Norton (2012:456) noted: "where I think economists may remain open to criticism is that, having recognized the necessary incompleteness of their results, they do not do much to clarify what is missing." Clearly articulating the partiality of any single method is a major impetus for proposing a research menu, and it supports a transparent approach to both science and decision-making.

During the dissemination phase, there is opportunity to better understand how different methods influence the publics and the decision-makers. As Batker (2020) suggests, there is a need to evaluate what

different methods provide in different settings when implementing EE. The implication of a research program focused on influencing public sentiments, in combination with an experience-based model of learning (i.e., pragmatist epistemology and axiology), is that surveys, or other data collection methods, can themselves influence peoples' beliefs. This is a critical point, as a pragmatist EE would view data collection efforts as a way to get people to engage reflective thinking about their own connections to nature, or at least gain an increased understanding of how others relate to nature.

4. Applying the process-based methodology of pragmatist ecological economics

A pragmatist EE is process-oriented, whereby the quality of management, planning and policy decisions is commensurate with the investment in the process aimed at addressing some complex social-ecological problem. The pragmatist EE researcher looks to actively engage with social processes (e.g., land management planning efforts), with the goal of facilitating communication and mutual learning among all involved around the portion of human-nature relationships of focus within social-ecological contexts. We consider several priorities for a researcher applying a pragmatist EE methodology in practice.

4.1. Engage social processes to navigate differences

While transdisciplinary approaches have been variously defined, Lawrence et al. (2022) suggest they have several characteristics, including: an effort to transcend disciplinary boundaries, the involvement of societal actors (non-academics) in the process, a focus on real-world problems with a goal to support action or intervention, an orientation toward the common good, and thorough awareness and consideration of the broader context. Adding some detail to the idea of transdisciplinary work, Chambers et al. (2021) analyzed 32 cases using co-production and identified six different modes, and the 'navigating differences' mode of co-production aligns with the pragmatist philosophy advocated herein. This co-production mode has a strong emphasis "on managing processes of relating together, learning and empowerment over producing and transferring scientific knowledge about human-ecosystem interactions...[and] facilitation techniques and boundary objects were used to connect stakeholder groups to explore conflicts and reframe perspectives, while allowing new institutions, regulation and practices to emerge" (Chambers et al., 2021:989).

Among the hazy landscape of transdisciplinary research, a pragmatist EE directs efforts to understanding values, connections, benefits, preferences, ecosystem services, and nature's contributions to people in order to navigate differences. This approach to co-production can facilitate an opportunity to work with practitioners on democratic processes, and potentially facilitate the construction of institutions that can, as Akbulut and Adaman (2020) suggest, provide venues for such processes. A prerequisite to such work is building relationships with practitioners (critical to implementing EE (Batker, 2020)), and, for example, we can report success integrating into, and influencing, public participation processes in U.S. public land planning contexts. For instance, in support of the Gila National Forest plan revision in New Mexico, we collaborated with land managers to develop a process for running five public meetings in 2016; the meetings included a component where members of the public expressed their views on important and unimportant ecosystem services (Armatas et al., 2022a). Similarly, we integrated into a river planning process in Montana in 2019 (Armatas et al., 2022b), and we interviewed participants about the process and the benefit of seeing the different perspectives of the interested public. We heard comments that suggested participants were engaging in reflective thinking about their own human-nature relationships, were appreciative of seeing the perspectives of others, and were learning about others' perspectives and were open to having their views influenced. Research is not just about what is learnt (i.e., new insights), but it is also about

involving many in learning to gain new insights as well as other benefits of being involved in learning (e.g., relationships, shared purpose). Thus, research builds capacity (to learn) as well as a resilience in the face of uncertainty.

4.2. Center human-nature relationships without judgment

Judgment-free centering of human-nature relationships (i.e., stressing that no human-nature relationship is right or wrong) facilitates social processes among decision-makers and the diverse publics by, fundamentally, raising awareness about the various ways people relate to and interact with nature. A primary goal of centering human-nature relationships is, at least initially, a consensus in understanding. Even if someone feels that a decision did not align with their desires, they may be more accepting of the outcome if they fully understand the process and rationale that led to some decision.

Centering human-nature relationships may also generate shared understanding about the challenging task of achieving sustainable outcomes. For instance, while embedded in a planning process for the Flathead Wild and Scenic River in Montana, USA, we asked people engaged in the public process how they might approach the planning task, given the diverse human-nature relationships that existed. Many respondents acknowledged the challenging and unenviable decision facing managers and planners; one participant noted: "It is easy to complain, it is easy to point out problems. The solutions, finding the solutions, it's tough...I don't have great answers on how you find solutions. Ultimately, I think communication is the key; communication, education, transparency, are the keys" (Armatas et al., 2020:89).

4.3. De-privilege singular sources of knowledge and highlight partial understandings

The research menu (Fig. 3) provides a heuristic for highlighting the partial understanding that different methods provide. Generally, stressing that understanding even a portion of complex human-nature relationships can only be comprehensively made with multiple approaches de-privileges any single source of knowledge. This is important, in large part, because it conveys the importance of investing in the social process, whereby diverse stakeholders and rightsholders are welcomed into a collaborative space to both contribute their ideas and build relationships with practitioners and other members of the public. Those relationships are, in part, built over a shared dilemma of addressing some complex issue.

Without an authoritative, singular source of knowledge, the power dynamics related to who 'belongs' at the decision-making table may be mitigated, as a more collaborative approach is prioritized with the assumption that a variety of knowledge types can contribute. The 'navigating differences' mode of co-production was shown to value "all forms of expertise, and effectively minimized hierarchies to directly engage with actors across power differentials" (Chambers et al., 2021:989). Embracing the limits of our understanding of diverse and complex human-nature relationships can hopefully create a foundation for humility, and perhaps facilitate discussion around theoretical rigor in applied contexts (Batker, 2020). The idea of humility, and embracing and characterizing the process of how humans collectively come to know and understand aligns with the ecological economic foundations articulated by Goddard et al. (2019).

4.4. Define sustainability locally through earnest and thorough consideration

Foundational to a community wrangling with a social-ecological problem is that the current reality (how things are) is concerning enough to warrant discussions about some desired alternative reality (how things ought to be). What "is" today is not necessarily what it "ought" to be. In the broadest sense, this moving toward normative

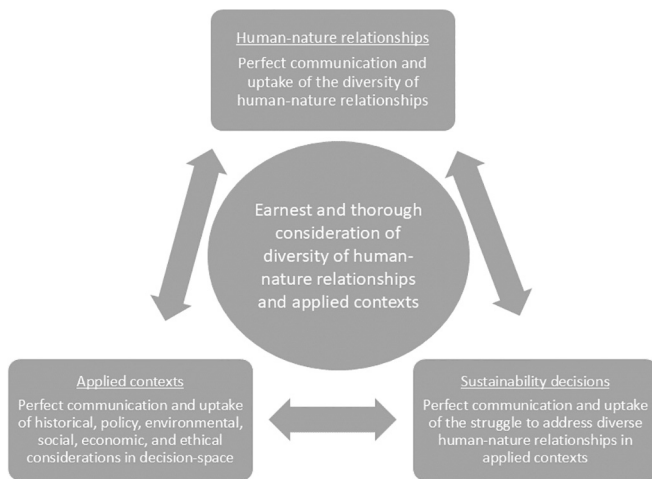


Fig. 4. Theoretical convergence of the objective (how it is) and the normative (how it ought to be) in pragmatist ecological economics.

sustainability requires an earnest and thorough consideration, by those engaged in relevant social processes, of diverse human-nature relationships in applied contexts (Fig. 4). As highlighted above, the role of a pragmatist EE is to focus on a portion of human-nature relationships, but Fig. 4 takes a high-level approach to pursuing normative sustainability. Therefore, we would expect that earnest and thorough consideration of human-nature relationships would include researchers and practitioners from a variety of backgrounds and, likely, transdisciplinary hybrid fields.

Earnest and thorough consideration involves the embrace of varied semantic and knowledge forms, and provides an opportunity, for instance, to incorporate the artistic elements of even the most technical pursuits such as climate modeling (Herrmann-Pillath, 2020). Earnest and thorough consideration involves, as Blignaut and Aronson (2020:6) phrase it, “embracing the narrative” whereby actors express their views of the past and the need or imperative for change. Earnest and thorough consideration will inevitably provide opportunities within social processes to incorporate important priorities of EE, including environmental ethics (Washington and Maloney, 2020) and the influence of political and governance institutions (Vatn, 2020). Given that earnest and thorough consideration will likely require conversations with perhaps hundreds or thousands of individuals over time (i.e., communities), there is a need for structured engagement approaches (e.g., approaches on the research menu) that have tested systematic and transparent methodologies (Armatas et al., 2022a).

To be clear, achieving normative sustainability through perfect communication and uptake, as illustrated in Fig. 4, is a theoretical endpoint, and we are not suggesting some utopian state. Nor are we suggesting (perhaps in contrast to Blignaut and Aronson (2020)) that a shared vision will emerge that is fully satisfactory to all actors involved. Instead, the theoretical endpoint is a place where all involved have mutual understanding, where outcomes are likely not universally embraced, but instead there is satisfaction with the process as an earnest and thorough effort to support the collective given the complex circumstances of some social-ecological context.

5. Conclusion

A major implication for a pragmatist EE researcher is the need to address two separate, but major, tasks. First is the design and implementation of applied methods to understand diverse human-nature relationships in applied contexts. And second is the evaluation of the types of knowledge (and thus what methods) are most effective for helping decision-makers understand the public, the public understand each other, and the public understand the decision-makers. There are

numerous challenges associated with effectively engaging social processes while (simultaneously) developing, progressing, participating in, and evaluating the process itself. Nonetheless, it is likely a challenge worth trying to overcome.

CRedit authorship contribution statement

Christopher A. Armatas: Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Conceptualization. **William T. Borrie:** Writing – review & editing, Writing – original draft, Supervision, Resources, Project administration, Methodology, Investigation, Conceptualization.

Declaration of competing interest

None.

Data availability

No data was used for the research described in the article.

Acknowledgements

We acknowledge support for this research from the Aldo Leopold Wilderness Research Institute, Rocky Mountain Research Station, USDA Forest Service and from Deakin University. The findings and conclusions in this publication are those of the authors and should not be construed to represent any official U.S. Department of Agriculture or U.S. Government determination or policy.

References

- Akbulut, B., Adaman, F., 2020. The ecological economics of economic democracy. *Ecol. Econ.* 176, 106750. <https://doi.org/10.1016/j.ecolecon.2020.106750>.
- Anderson, P.F., 1986. On method in consumer research: a critical relativist perspective. *J. Consum. Res.* 13, 155–173.
- Anderson, D., 2011. Peirce, observation, and the discipline of waiting. In: Frega, R. (Ed.), *Pragmatist Epistemologies*. Lexington Books, Plymouth, UK, pp. 7–22.
- Anderson, B., M'Gonigle, M., 2012. Does Ecological Economics Have a Future? Contradiction and Reinvention in the Age of Climate Change. <https://doi.org/10.1016/j.ecolecon.2012.06.009>.
- Armatas, C.A., Watson, A.E., Borrie, W.T., 2020. The Flathead wild and Scenic River system: Results from public engagement asking about human-nature relationships, threats and contributors to such relationships, and opinions about planning and management. In: Aldo Leopold Wilderness Research Institute, Prepared for the Flathead River Wild and Scenic Comprehensive River Management Planning Team. Missoula, MT.
- Armatas, C.A., Borrie, W.T., Watson, A.E., 2022a. A social science method for public engagement in the context of natural resource planning in the United States. *Soc. Nat. Resour.* 35, 506–526. <https://doi.org/10.1080/08941920.2021.1996666>.
- Armatas, C.A., Borrie, W.T., Watson, A.E., 2022b. Human-nature relationships for the Flathead wild and Scenic River system: analyzing diversity, synergies, and tensions in a mountainous region of Montana, USA. In: Misiune, I., Depellegrin, D., Egarter Vigl, L. (Eds.), *Human-Nature Interactions: Exploring Nature's Values Across Landscapes*. Springer, pp. 141–153. https://doi.org/10.1007/978-3-031-01980-7_12.
- Batker, D., 2020. Implementing ecological economics. *Ecol. Econ.* 172, 106606. <https://doi.org/10.1016/j.ecolecon.2020.106606>.
- Baumgärtner, S., Becker, C., Frank, K., Müller, B., Quaas, M., 2008. Relating the philosophy and practice of ecological economics: the role of concepts, models, and case studies in inter- and transdisciplinary sustainability research. *Ecol. Econ.* 67, 384–393. <https://doi.org/10.1016/j.ecolecon.2008.07.018>.
- Bernstein, R.J., 1989. Pragmatism, pluralism and the healing of wounds. *Proc. Address. Am. Philos. Assoc.* 63, 5–18. <https://doi.org/10.2307/3130079>.
- Blignaut, J., Aronson, J., 2020. Developing a restoration narrative: a pathway towards system-wide healing and a restorative culture. *Ecol. Econ.* 168, 106483. <https://doi.org/10.1016/j.ecolecon.2019.106483>.
- Borrie, W.T., Armatas, C.A., 2022. Environmental values and Nature's contributions to people: Towards methodological pluralism in evaluation of sustainable ecosystem services. In: Misiune, I., Depellegrin, D., Egarter Vigl, L. (Eds.), *Human-Nature Interactions: Exploring Nature's Values across Landscapes*. Springer, pp. 13–23. https://doi.org/10.1007/978-3-031-01980-7_2.
- Bromley, D.W., 2008. Volitional pragmatism. *Ecol. Econ.* 68, 1–13. <https://doi.org/10.1016/j.ecolecon.2008.08.012>.
- Catton, W.R., 1994. Foundations of human ecology. *Sociol. Perspect.* 37, 75–95. <https://doi.org/10.2307/1389410>.

- Chambers, J.M., Wyborn, C., Ryan, M.E., Reid, R.S., Riechers, M., Serban, A., Bennett, N. J., Cvitanovic, C., Fernández-Giménez, M.E., Galvin, K.A., Goldstein, B.E., Klenk, N. L., Tengö, M., Brennan, R., Cockburn, J.J., Hill, R., Munera, C., Nel, J.L., Österblom, H., Bednarek, A.T., Bennett, E.M., Brandeis, A., Charli-Joseph, L., Chatterton, P., Curran, K., Dumrongrojwattana, P., Durán, A.P., Fada, S.J., Gerber, J.-D., Green, J.M.H., Guerrero, A.M., Haller, T., Horcea-Milcu, A.-I., Leimona, B., Montana, J., Rondeau, R., Spierenburg, M., Steyaert, P., Zaehring, J. G., Gruby, R., Hutton, J., Pickering, T., 2021. Six modes of co-production for sustainability. *Nat. Sustain.* 4, 983–996. <https://doi.org/10.1038/s41893-021-00755-x>.
- Costanza, R., 1991. Ecological economics: a research agenda. *Struct. Chang. Econ. Dyn.* 2, 335–357. [https://doi.org/10.1016/S0954-349X\(05\)80007-4](https://doi.org/10.1016/S0954-349X(05)80007-4).
- Dewey, J., 1927. *The Public and its Problems*. Henry Hold and Company, United States of America.
- Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R.T., Molnár, Z., Hill, R., Chan, K.M.A., Baste, I.A., Brauman, K.A., Polasky, S., Church, A., Lonsdale, M., Larigauderie, A., Leadley, P.W., van Oudenhoven, A.P.E., van der Plaats, F., Schröter, M., Lavorel, S., Aumeeruddy-Thomas, Y., Bukvareva, E., Davies, K., Demissew, S., Erpul, G., Failler, P., Guerra, C.A., Hewitt, C.L., Keune, H., Lindley, S., Shirayama, Y., 2018. Assessing nature's contributions to people. *Science* 359. <https://doi.org/10.1126/science.aap8826>, 270 LP – 272.
- Dow, S.C., 2004. Structured pluralism. *J. Econ. Methodol.* 11, 275–290. <https://doi.org/10.1080/1350178042000252965>.
- Dow, S.C., 2007. Variety of methodological approach in economics. *J. Econ. Surv.* 21, 447–465. <https://doi.org/10.1111/j.1467-6419.2007.00510.x>.
- Durning, D., 1999. The transition from traditional to postpositivist policy analysis: a role for Q-methodology. *J. Policy Anal. Manage.* 18, 389–410. [https://doi.org/10.1002/\(SICI\)1520-6688\(199922\)18:3<389::AID-PAM4>3.0.CO;2-S](https://doi.org/10.1002/(SICI)1520-6688(199922)18:3<389::AID-PAM4>3.0.CO;2-S).
- Dvorak, R.G., Borrie, W.T., Watson, A.E., 2013. Personal wilderness relationships: building on a transactional approach. *Environ. Manag.* 52, 1518–1532. <https://doi.org/10.1007/s00267-013-0185-7>.
- Evely, A.C., Fazey, I., Pinard, M., Lambin, X., 2008. The influence of philosophical perspectives in integrative research: a conservation case study in the Cairngorms National Park. *Ecol. Soc.* 13. <https://doi.org/10.5751/ES-02679-130252>.
- Farley, J., Kish, K., 2021. Ecological economics: the next 30 years. *Ecol. Econ.* 190, 107211. <https://doi.org/10.1016/j.ecolecon.2021.107211>.
- Flint, C.G., Kunze, I., Muhar, A., Yoshida, Y., Penker, M., 2013. Exploring empirical typologies of human–nature relationships and linkages to the ecosystem services concept. *Landsc. Urban Plan.* 120, 208–217. <https://doi.org/10.1016/j.landurbplan.2013.09.002>.
- Friedrichs, J., Kratochwil, F., 2009. On acting and knowing: how pragmatism can advance international relations research and methodology. *Int. Organ.* 63, 701–731. <https://doi.org/10.1017/S0020818309990142>.
- Funtowicz, S.O., Ravetz, J.R., 1993. Science for the post-normal age. *Futures* 25, 739–755. [https://doi.org/10.1016/0016-3287\(93\)90022-L](https://doi.org/10.1016/0016-3287(93)90022-L).
- Goddard, J.J., Kallis, G., Norgaard, R.B., 2019. Keeping multiple antennae up: Coevolutionary foundations for methodological pluralism. *Ecol. Econ.* 165, 106420. <https://doi.org/10.1016/j.ecolecon.2019.106420>.
- Goeminne, G., 2011. Has science ever been normal? On the need and impossibility of a sustainability science. *Futures* 43, 627–636. <https://doi.org/10.1016/j.futures.2011.04.001>.
- Gowdy, J., Erickson, J.D., 2005. The approach of ecological economics. *Camb. J. Econ.* 29, 207–222. <https://doi.org/10.1093/cje/bei033>.
- Haack, S., 2009. *Evidence and Inquiry: A Pragmatist Reconstruction of Epistemology*, 2nd expanded edition. Prometheus Books, Amherst, New York.
- Hein, L., van Koppen, K., de Groot, R.S., van Ierland, E.C., 2006. Spatial scales, stakeholders and the valuation of ecosystem services. *Ecol. Econ.* 57, 209–228. <https://doi.org/10.1016/j.ecolecon.2005.04.005>.
- Herrmann-Pillath, C., 2020. The art of co-creation: an intervention in the philosophy of ecological economics. *Ecol. Econ.* 169, 106526. <https://doi.org/10.1016/j.ecolecon.2019.106526>.
- Hickman, L.A., 2009. John Dewey: His life and work. In: Hickman, L.A., Neubert, S., Reich, K. (Eds.), *John Dewey between Pragmatism and Constructivism*. Fordham University Press, United States of America, pp. 3–18.
- Hildebrand, D.L., 2011. Could experience be more than a method? Dewey's practical starting point. In: Frega, R. (Ed.), *Pragmatist Epistemologies*. Lexington Books, Plymouth, UK, pp. 41–60.
- Hildebrand, D., Zalta, E.N., 2018. John Dewey, Winter, 201. ed. *Metaphysics Research Lab*, Stanford University <https://plato.stanford.edu/archives/win2018/entries/dewey/>.
- Howarth, R.B., 2008. Editorial. *Ecol. Econ.* 64, 469. [https://doi.org/10.1016/S0921-8009\(07\)00577-0](https://doi.org/10.1016/S0921-8009(07)00577-0).
- Hudson, L.A., Ozanne, J.L., 1988. Alternative ways of seeking knowledge in consumer research. *J. Consum. Res.* 14, 508–521. <https://doi.org/10.1086/209132>.
- Ives, C.D., Abson, D.J., von Wehrden, H., Dorninger, C., Klaniecki, K., Fischer, J., 2018. Reconnecting with nature for sustainability. *Sustain. Sci.* 13, 1389–1397. <https://doi.org/10.1007/s11625-018-0542-9>.
- Laudan, L., 1984. *Science and Values: The Aims of Science and their Role in Scientific Debate*. University of California Press.
- Lawrence, M.G., Williams, S., Nanz, P., Renn, O., 2022. Characteristics, potentials, and challenges of transdisciplinary research. *One Earth* 5, 44–61. <https://doi.org/10.1016/j.oneear.2021.12.010>.
- Levin, B., 2013. To know is not enough: research knowledge and its use. *Rev. Educ.* 1, 2–31. <https://doi.org/10.1002/rev3.3001>.
- Levrel, H., Martinet, V., 2021. Ecological economists: the good, the bad, and the ugly? *Ecol. Econ.* 179, 106694. <https://doi.org/10.1016/j.ecolecon.2020.106694>.
- Minteer, B.A., 2012. *Refounding Environmental Ethics: Pragmatism, Principle, and Practice*. Temple University Press, Philadelphia, PA.
- Moon, K., Blackman, D., 2014. A guide to understanding social science research for natural scientists. *Conserv. Biol.* 28, 1167–1177. <https://doi.org/10.1111/cobi.12326>.
- Morgan, G., Smircich, L., 1980. The case for qualitative research. *Acad. Manag. Rev.* 5, 491–500. <https://doi.org/10.2307/257453>.
- Munda, G., 1997. Environmental economics, ecological economics, and the concept of sustainable development. *Environ. Values* 6, 213–233. <https://doi.org/10.3197/09632719776679158>.
- Neumayer, E., 2013. *Weak Versus Strong Sustainability: Exploring the Limits of Two Opposing Paradigms*, Fourth edition. Edward Elgar, Cheltenham, UK.
- Norgaard, R.B., 1989. The case for methodological pluralism. *Ecol. Econ.* 1, 37–57.
- Norton, B.G., 2005. *Sustainability: A Philosophy of Adaptive Ecosystem Management*. University of Chicago Press, Chicago, IL, USA.
- Norton, B.G., 2007. Politics and epistemology: inclusion and controversy in adaptive management processes. *Environ. Ethics* 29, 299–306.
- Norton, B.G., 2012. The ways of wickedness: analyzing messiness with messy tools. *J. Agric. Environ. Ethics* 25, 447–465. <https://doi.org/10.1007/s10806-011-9333-3>.
- Norton, B.G., 2015. *Sustainable Values, Sustainable Change: A guide to environmental decision-making*. The University of Chicago Press, Chicago and London.
- Pascual, U., Balvanera, P., Anderson, C.B., Chaplin-Kramer, R., Christie, M., González-Jiménez, D., Martin, A., Raymond, C.M., Termansen, M., Vatn, A., Athayde, S., Baptiste, B., Barton, D.N., Jacobs, S., Kelemen, E., Kumar, R., Lazos, E., Mwampamba, T.H., Nakangu, B., O'Farrell, P., Subramanian, S.M., van Noordwijk, M., Ahn, S., Amaruzaman, S., Amin, A.M., Arias-Arévalo, P., Arroyo-Robles, G., Cantú-Fernández, M., Castro, A.J., Contreras, V., De Vos, A., Dendoncker, N., Engel, S., Eser, U., Faith, D.P., Filayushkina, A., Ghazi, H., Gómez-Baggethun, E., Gould, R.K., Guibrunet, L., Gundimeda, H., Hahn, T., Harmáčková, Z. V., Hernández-Blanco, M., Horcea-Milcu, A.-I., Huambachano, M., Wicher, N.L.H., Aydin, C.I., Islar, M., Koessler, A.-K., Kenter, J.O., Kosmus, M., Lee, H., Leimona, B., Lele, S., Lenzi, D., Lliso, B., Mannetti, L.M., Merçon, J., Monroy-Sais, A.S., Mukherjee, N., Muraca, B., Muradian, R., Murali, R., Nelson, S.H., Nemogá-Soto, G. R., Ngouhou-Poufoun, J., Niamir, A., Nuesiri, E., Nyumba, T.O., Özkaynak, B., Palomo, I., Pandit, R., Pawłowska-Mainville, A., Porter-Bolland, L., Quaas, M., Rode, J., Rozzi, R., Sachdeva, S., Samakov, A., Schaafsma, M., Sitas, N., Ungar, P., Yiu, E., Yoshida, Y., Zent, E., 2023. Diverse values of nature for sustainability. *Nature* 620, 813–823. <https://doi.org/10.1038/s41586-023-06406-9>.
- Patterson, M.E., Williams, D.R., 1998. Paradigms and problems: the practice of social science in natural resource management. *Soc. Nat. Resour.* 11, 279–295. <https://doi.org/10.1080/08941929809381080>.
- Patterson, M.E., Williams, D.R., 2005. Maintaining research traditions on place: diversity of thought and scientific progress. *J. Environ. Psychol.* 25, 361–380. <https://doi.org/10.1016/j.jenvp.2005.10.001>.
- Patton, M.Q., 2002. *Qualitative Research & Evaluation Methods*, 3rd edition. Sage Publications, London.
- Peirce, C.S., 1868. Some consequences of four incapacities. In: Buchler, J. (Ed.), *Philosophical Writings of Peirce*. Dover, New York.
- Puller, A., Smith, T., 2017. A critical and realist approach to ecological economics. In: *Routledge Handbook of Ecological Economics: Nature and Society*. Routledge, London and New York.
- Ramos-Martin, J., 2003. Empiricism in ecological economics: a perspective from complex systems theory. *Ecol. Econ.* 46, 387–398. [https://doi.org/10.1016/S0921-8009\(03\)00191-5](https://doi.org/10.1016/S0921-8009(03)00191-5).
- Rittel, H.W.J., Webber, M.M., 1973. Dilemmas in a general theory of planning. *Policy. Sci.* 4, 155–169.
- Robbins, P., 2012. *Political Ecology: A Critical Introduction*. John Wiley & Sons, Ltd, West Sussex, UK.
- Røpke, I., 2005. Trends in the development of ecological economics from the late 1980s to the early 2000s. *Ecol. Econ.* 55, 262–290. <https://doi.org/10.1016/j.ecolecon.2004.10.010>.
- Söderbaum, P., 2008. *Understanding Sustainability Economics: Toward Pluralism in Economics*. Earthscan, London.
- Soulé, M.E., 1985. What is conservation biology? *BioScience* 35, 727–734. <https://doi.org/10.2307/1310054>.
- Spash, C.L., 2012. New foundations for ecological economics. *Ecol. Econ.* 77, 36–47. <https://doi.org/10.1016/j.ecolecon.2012.02.004>.
- Spash, C.L., 2013. The shallow or the deep ecological economics movement? *Ecol. Econ.* 93, 351–362. <https://doi.org/10.1016/j.ecolecon.2013.05.016>.
- Spash, C.L., 2015. The content, direction and philosophy of ecological economics. In: Martinez-Alier, J., Muradian, R. (Eds.), *Handbook of Ecological Economics*. Edward Elgar Publishing, Inc., Cheltenham, UK.
- Spash, C.L., 2020. A tale of three paradigms: Realising the revolutionary potential of ecological economics. *Ecol. Econ.* 169, 106518. <https://doi.org/10.1016/j.ecolecon.2019.106518>.
- Spash, C.L., 2021. A reply to Levrel and Martinet. *Ecol. Econ.* 179, 106695. <https://doi.org/10.1016/j.ecolecon.2020.106695>.
- Stern, M.J., 2018. *Social Science Theory for Environmental Sustainability: A Practical Guide, Techniques in Ecology & Conservation*. Oxford University Press, Oxford, New York.
- Stern, M.J., Briske, D.D., Meadow, A.M., 2021. Opening learning spaces to create actionable knowledge for conservation. *Conserv. Sci. Pract.* 3, 1–12. <https://doi.org/10.1111/csp2.378>.
- Tacconi, L., 1998. Scientific methodology for ecological economics. *Ecol. Econ.* 27, 91–105. [https://doi.org/10.1016/S0921-8009\(97\)00134-1](https://doi.org/10.1016/S0921-8009(97)00134-1).

- Vatn, A., 2020. Institutions for sustainability—towards an expanded research program for ecological economics. *Ecol. Econ.* 168, 106507. <https://doi.org/10.1016/j.ecolecon.2019.106507>.
- Washington, H., Maloney, M., 2020. The need for ecological ethics in a new ecological economics. *Ecol. Econ.* 169, 106478. <https://doi.org/10.1016/j.ecolecon.2019.106478>.
- Webb, J.L., 2007. Pragmatisms (plural) part 1: classical pragmatism and some implications for empirical inquiry. *J. Econ. Issues* 41, 1063–1086. <https://doi.org/10.1080/00213624.2007.11507087>.
- Westbrook, R.B., 1993. A new pragmatism. *Am. Q.* 45, 438–444. <https://doi.org/10.2307/2713243>.
- Williams, D.R., 2014a. Making sense of ‘place’: reflections on pluralism and positionality in place research. *Landsc. Urban Plan.* 131, 74–82. <https://doi.org/10.1016/j.landurbplan.2014.08.002>.
- Williams, D.R., 2014b. ‘Beyond the commodity metaphor’ revisited: Some methodological reflections on place attachment research. In: Manzo, L.M., Devine-Wright, P. (Eds.), *Place Attachment: Advances in Theory, Methods, and Research*. Routledge, London and New York, pp. 89–99.