

A review of worldviews beyond sustainability

Potential avenues for human-nature connectedness

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Keywords: mental models; awareness; knowledge system; systems-thinking; indigenous knowledge; complexity.

Abstract. *Although there is increasing awareness of worldviews as leverage points for transformative change, deeper understanding of the nuances between worldviews and how they frame complex human-nature relationships is needed. This review paper aims to synthesize current literature on how sustainability can be conceptualized across diverse worldviews. A quantitative database search was used to review peer-reviewed English-speaking scholarship. A qualitative content analysis was conducted to identify key knowledge themes and shared concepts. The results indicated overwhelming support for human-nature connectedness expressed uniquely across six identified knowledge themes. Shared concepts were found across each of these knowledge types and illustrated through a matrix of examples from the literature. This review paper synthesizes and connects transdisciplinary concepts through concrete examples, highlights gaps, and offers future research directions around activating reflexivity on worldviews. It also provides critical discussion on the limitations of conducting a literature review on the vast and complex topic of worldviews and sustainability. The combination of these contributions could provide readers with an entry point in expanding their own worldviews, as a supportive process to the larger-scale systems change needed for sustainability transformations.*

1. Introduction

“Can we transform our societies rapidly and generate an equitable, inclusive, and sustainable world?” Vogel and O’Brien echo this urgent question raised by many (2021: p. 1). To better address this challenge, scholars are increasingly calling for greater awareness on the deep leverage points for transformative action: underlying values, beliefs and mental models (Hornsey & Fielding, 2020; Woiwode et al., 2021). These social phenomena form the basis of *worldviews*, or the overarching philosophies that guide our ideologies, decision-making and actions (Du Plessis & Brandon, 2015; Rousseau & Billingham, 2018). However, reductionist and modernist scientific worldviews have shaped sustainability discourse for decades, which tend to reproduce the same systems that distance humans from nature (Abram et al., 2020; Boetto, 2019). Consequently, there is

growing research on greater (re)awareness and adoption of worldviews that consider humans as part of the bigger web of life, such as Indigenous wisdom, Eastern spirituality or systems-thinking perspectives (Du Plessis & Brandon, 2015; Shrivastava et al., 2020; Spanning & Hawke, 2022; Tadaki et al., 2017).

However, literature on worldviews and sustainability tends to remain siloed within specific disciplines and research streams, which can be challenging for a broader audience to access. This contrasts recent calls for greater transdisciplinary and plural forms of knowledge as a means for mobilizing transformative change (Caniglia et al., 2020; Fazey et al., 2020). Furthermore, deeper understanding of the nuances between worldviews and how they frame complex human-nature relationships is urgently needed (van Opstal & Hugé, 2013).

Therefore, this literature review aims to close this gap by offering a synthesized overview of how sustainability can be conceptualized across diverse worldviews. This paper is intended for a transdisciplinary audience to gain broad awareness on current discourse in peer-reviewed academic literature as well as critically reflect upon the limitations of such objective. Worldviews on sustainability are highly complex, constantly evolving and derive from diverse cultures, disciplines, and practices. This review offers just one perspective into this complexity, and the limitations around the scope of reviewed literature, methodology and the author's own worldview are critically discussed in the paper.

The paper is outlined as followed: first, a theoretical framing of worldviews is used to guide the reading of this paper (Section 2). Second, the methodology is explained (Section 3). Third, the results are organized into four sections: an overview of the overarching theme of human-nature connectedness (Section 4.1), six key knowledge themes that have diverse interpretations of human-nature connectedness (Section 4.2), shared concepts across these different knowledge themes (Section 4.3) and (un)learning pathways needed for transitioning to worldviews beyond sustainability (Section 4.4). Finally, the results, gaps, and limitations, including a self-reflection of the author's own worldview, and future research directions are discussed (Section 5).

2. Theoretical Framing

Worldviews: ways of understanding multiple interpretations of sustainability

Worldview is commonly understood as the “lens” or “glasses” in which reality is understood (Gale et al., 2019; McIntosh, 2007; van Egmond & de Vries, 2011). Others describe worldviews as the cognitive structures or frameworks to collect,

analyze and generate meaning from information gained from the world (Abi-Hashem, 2017; Hedlund-de Witt, 2013; Mascolo, 2014). Although other terms can be used in place of worldview, there are important distinctions to be made. For example, systems-thinking literature commonly uses “mental model” as a synonym, yet scholars argue that this represents the mechanisms and decision-making processes *under* the umbrella of worldviews (Laininen, 2018; Luthé, 2016; Senge, 1999). Similarly, the term “ways of knowing” is commonly used to refer to the diversity of practices needed to advance sustainability transformations, yet is not necessarily synonymous with worldview (Goldstein et al., 2015; Meighan, 2021). Many scholars advocate that worldview is the most comprehensive term to describe these ideas, which includes related concepts like perspective, mindset or mental model (Boik, 2020; Rousseau & Billingham, 2018; van Opstal & Hugé, 2013). Building off Gabora and Merrifield, this paper defines worldview as a dynamic and flexible process in which understandings of reality are continuously gained through both individual and collective interpretation of knowledge, beliefs, values and norms (2012).

Worldviews are critical to sustainability transformations as they represent the deepest leverage areas for change (Davelaar, 2021; Lam, Martín-López, et al., 2020). To better understand how they function, scholars have attempted to quantify and measure worldviews based on frameworks such as the Cultural Worldview (CW) scale (Choi & Fielding, 2016), the Ingelhard-Welzel cultural map (Inglehart & Welzel, 2005) and the Worldview Inquiry Framework (Rousseau & Billingham, 2018). Within sustainability discourse, there has been an effort to classify worldviews to understand different positions on sustainability and relationships with nature, i.e., organized as a range of “ideal-typical” worldviews from “traditional,” “modern,” “post-modern,” and recently, “ecological” (Du Plessis & Brandon, 2015), “integral” or “holistic” (Cayre et al., 2018; Gale et al., 2019; Hedlund-de Witt, 2013). Research suggests that modern worldviews (supporting rationality, predictability and logic) and reductionist scientific worldviews (emphasizing simplification of complex phenomena), have contributed to the artificial separation of humans from nature (Ives et al., 2018; Latour, 2015), exploitive capitalism, and colonialism (Gram-Hanssen et al., 2022; Whyte, 2020). Paradoxically, it has also guided much of the sustainability discourse in the last decades (Laininen, 2018; Moore, 2017). While efforts to reconnect humans with nature are nothing new - from the Bishnoi environmental activism in the 1700s, to the more recent environmental movements of the 1960s and 70s, and the 1987 Brundtland Commission’s proposal for sustainable development – we are more disconnected now than ever (Ives et al., 2018). Recently, more widespread agreement is emerging that reductionist worldviews

which oversimplify human-nature relationships are not sufficient to fully understand and address the complexity of global environmental change, and the urgent social-ecological crisis we face today (Guterres, 2021; Herrfahrtdt-Pähle et al., 2020; Thiermann & Sheate, 2020).

In response, researchers from sustainability science, humanities, design and more are advocating for “ecological” or “regenerative” worldviews that expand beyond modernist interpretations of sustainability (Du Plessis & Brandon, 2015; Kambo et al., 2016; Liobikienė & Poškus, 2019). However, different disciplines and cultures have various understandings of what constitutes such worldviews needed to advance sustainability transformations. Researchers highlight the urgent need to cross-connect between these diverse approaches, ways of knowing and paradigms (van Opstal & Hugé, 2013). Some have interpreted this by proposing an integral worldview that attempts to merge different ontological perspectives and values together (De Witt et al., 2016; van Egmond & de Vries, 2011). Yet this overemphasis on classification and integration of predefined worldviews oversimplifies the complexity of multiple understandings of sustainability that are needed to decolonize and build inclusivity in addressing the social-ecological crisis (Caniglia et al., 2020; Lima & Partidario, 2020). Instead, further research is needed to negotiate the nuance of how sustainability is framed across a wider range of worldviews (van Opstal & Hugé, 2013).

To contribute to this effort, this review paper aims to synthesize current peer-reviewed literature on how sustainability can be conceptualized across diverse worldviews, as both a narrative and visual overview (Figures 1 & 2). This paper strives to act as a learning tool for a broad audience, including practitioners, educators, and students, to help expand our own worldviews by simultaneously acknowledging distinct differences and broader consensus in how sustainability is expressed. Within these broader aims, the following research questions have guided the paper:

1. What is the current state of knowledge about worldviews and sustainability and how limited are we in knowing this? What are we able to understand through established quantitative review methods and literature within academic databases and what is missing from this discussion?
2. Instead of focusing on “ideal-typical” worldview typologies, what nuances can we learn about plural understandings of sustainability by looking at relationships between diverse knowledge themes and concepts shared between them?

3. How could (un)learning processes help us gain more awareness of our own worldviews (and limitations) and evolving human-nature connectedness?

3. Methodology

An iterative, multi-step approach was used to conduct this literature review (Table 1). First, an initial database search was conducted using broad keywords (Step 1) and the abstracts were coded for general themes and gaps (Step 2). Then, a subsequent database search was conducted with specific keywords that reflected the gaps identified from the first search (Step 3). Finally, all relevant abstracts from both searches were coded together using revised codes (Step 4). The following section describes this process in detail.

Methodology Overview

Step 1: First Database Search

Keyword: "sustainab and worldview" in SCOPUS and WoS
Reference screening via PRISMA Flow Diagram (Appendix B)



Step 2: Initial abstract coding - Qualitative Content Analysis (n = 789)

Broad themes and gaps identified for next iteration of keyword searches



Step 3: Second Database Search

Keywords: "regenerative" and "sustainab," "relational thinking", "care" and "post-human*," "mindfulness" and "sustainab" in SCOPUS and WoS Reference screening via PRISMA Flow Diagram (Appendix B)



Step 4: Qualitative Content Analysis of combined abstracts from all keyword searches (n= 877) with full text articles assessed (n = 89)

See Appendix A for list of SCOPUS and WoS excluded subject areas.

See Appendix B for PRISMA Flow Diagrams for each keyword search.

See Appendix C for list of codes and codings.

*The term "posthuman" was substituted for "sustainability" to specify the research streams more adequately around care ethics

Table 1. Overview of the four-step methodology for conducting this literature review. Keyword search period was from January 2021 to June 2021, with articles ranging from 1992 – 2021, with 82% published between 2011-2021 and 56% published between 2016 – June 2021. (Appendixes can be downloaded as pdf files at: <https://www.ojs.unito.it/index.php/visions/article/view/7309>)

A quantitative database search within SCOPUS and Web of Science (WoS) of peer-reviewed English-speaking literature was used to survey current academic discourse on worldviews and sustainability. Both SCOPUS and WoS are considered comparable tools for detailed cross-disciplinary analysis (Martín-Martín et al., 2021) and WoS also includes grey literature, or non-peer reviewed articles, books, conference proceedings, dissertations, etc. (Godin et al., 2015). The first keyword search of “worldview” and “sustainability” acted as the primary baseline search (Step 1). The well-established PRISMA (Preferred Reporting Items for Systematic reviews and Meta-analysis) flow diagram was used to provide transparency and replicability for the literature selection process (Moher et al., 2009), which is included in Appendix B. This first keyword search included an extensive amount of healthcare literature such as nursing, pharmacy, and biomedical engineering, which focus on patient/healthcare provider worldviews and sustainable practices in healthcare management. Since these topics fell outside the paper’s scope, they were excluded (See Appendix A). After combining references from SCOPUS and WoS and removing duplicates, a total of 946 abstracts were screened in this first database search (See Appendix B).

Keyword searches through quantitative databases were chosen in the attempt to grapple with the vast and diverse discourse on worldviews and sustainability, which also highlights important limitations. This methodology, as well as the PRISMA process, are widely accepted within scientific research. However, these approaches also illustrate the limitations of what kind of knowledge can ultimately be included in a literature review, which is further reflected upon in the discussion section of this paper. Furthermore, as discussed in Section 2, some authors may use different terms to describe the concept of worldview, such as “mental model” or “way of knowing.” Many other terms could also be appropriate descriptors, considering the highly diverse contexts in which worldviews can be understood. However, this review paper aims to capture a broad overview of peer-reviewed, English-speaking literature with a specific conceptual lens. Therefore, the term “worldview” was chosen as the primary keyword to pair with “sustainability,” as it is well-established within the literature to describe how sustainability is conceptualized by different cultures and disciplines (A. De Witt et al., 2016; Du Plessis & Brandon, 2015; Laininen, 2018).

Furthermore, despite the broad keyword search of “worldview and sustainability,” most of the reviewed literature stems from sustainability science, social-ecological systems research, social sciences and to a lesser degree, the humanities. The English-speaking and Western/Westernized scholarship provides a limited knowledge of how worldviews are conceptualized and

disseminated. The discussion section expands upon these limitations and which methodological practices could be adopted in the future for communicating a more diverse body of knowledge on worldviews.

After Step 1, the first keyword search process, a qualitative content analysis (QCA) (Mayring, 2019) through MAXQDA software was conducted to screen abstracts for initial themes and gaps (Step 2). A starting list of codes was informed by broad literature scanning, conference participation and peer group discussion before the database searches to identify a rich picture of concepts related to worldviews and sustainability. From this initial list, the codes "regenerative," "relational thinking," "care" and "mindfulness," represented the smallest percentage of the total codings within these abstracts (less than five codings), yet also represent some of the emerging research themes within sustainability science (Gibbons, 2020; Thiermann & Sheate, 2020; West et al., 2018, 2020). These codes were then used to perform a second database search (Step 3) excluding the word "worldview" to scan for literature that was not captured in the first search. Finally, a second round of QCA (Step 4) was conducted with all screened abstracts (n = 877) using a refined list of codes (Appendix C). During the coding process, there were several instances where large groups of articles were deemed irrelevant, even after the refined database searches. For example, when coding abstracts, over 50 texts were irrelevant because a remote-sensing software called "Worldview-3" was prompted in the initial database search but wasn't filtered out in the refined search since these articles were within environmental science disciplines.

Codes and codings were cross-checked in a pre-tested approach by a "sounding board" of scholars within the author's professional network. Eight experts were invited to engage in this "sounding board" for discussing the themes, concepts and codings identified in the database searches. Both semi-structured and informal brainstorming discussions over the course of eight months were conducted with the following eight international and multi-cultural experts: 1.) writer and educator in regenerative design 2.) environmental historian 3.) an Indigenous food specialist and member of a First Nations tribe 4.) ecologist and sustainability scientist 5.) landscape planner 6.) social and human geographer 7.) sustainability entrepreneur 8.) systemic designer. These individuals were invited because their expertise aligned with key themes within the reviewed literature. The main objective of these conversations with individuals from diverse cultures, practices, and disciplines was to expand and healthily challenge the author's own worldview. Although these experts did not contribute to the data collection, analysis of the results or writing of this paper, this "sounding board" process

stimulated important metalevel reflexivity for the author, inspiring the paper aims and worldview critique in the discussion section.

Finally, 6% of the references included in this paper are non-peer reviewed literature, falling into the category of grey literature. These include books and dissertations sourced from WoS as well as seminal books cited within the peer reviewed literature. These were included to accurately support citation credit and reinforce key themes and concepts found during the QCA.

4. Results

4.1 Overview

Overall, the results of the reviewed literature overwhelmingly suggest that human-nature connectedness is at the core of how sustainability is conceptualized across worldviews. This was the most frequently coded theme (included in 145 abstracts) within the QCA (Figure 1) and corroborates broader calls for reconnecting to nature as a fundamental aspect for mobilizing sustainability transformations (Ives et al., 2018; Riechers et al., 2021). Various terms such as “human-nature relationship,” “interrelationship,” “human-nature connectedness,” and “interconnectedness” were used interchangeably in the literature to describe this theme as the core of healthy, livable futures (Braitto et al., 2017; Dacks et al., 2019; Diver et al., 2019; Kaaronen, 2018). In this sense, worldviews that support deep human-nature connectedness go *beyond* sustainability: instead of only preventing additional harm, the focus must shift to restoring past damages to promote participatory, regenerative processes to nurture all life systems (Capra & Luisi, 2014; Gibbons, 2020; Wahl, 2006).

As illustrated in Figure 1, this overarching theme of human-nature connectedness was expressed differently across six key knowledge themes identified from the literature: Indigenous knowledge; local, place-based knowledge; systems thinking; spiritual, religious knowledge; subjective, inner knowledge and relational thinking (Section 4.2). Within and across these diverse knowledge themes, three shared concept clusters were synthesized based on the QCA codings: 1. Holism and complexity, 2. Well-being, regeneration, and resilience, and 3. Awareness and reflective mindsets (Section 4.3). Each of these three concept clusters contain important nuances on how sustainability is conceptualized differently across the six knowledge themes and are described through specific examples in Figure 2. Furthermore, the results also suggest critical (un)learning pathways needed for transitioning to worldviews beyond sustainability, as a possible precursor for transformative action (Section 4.4).

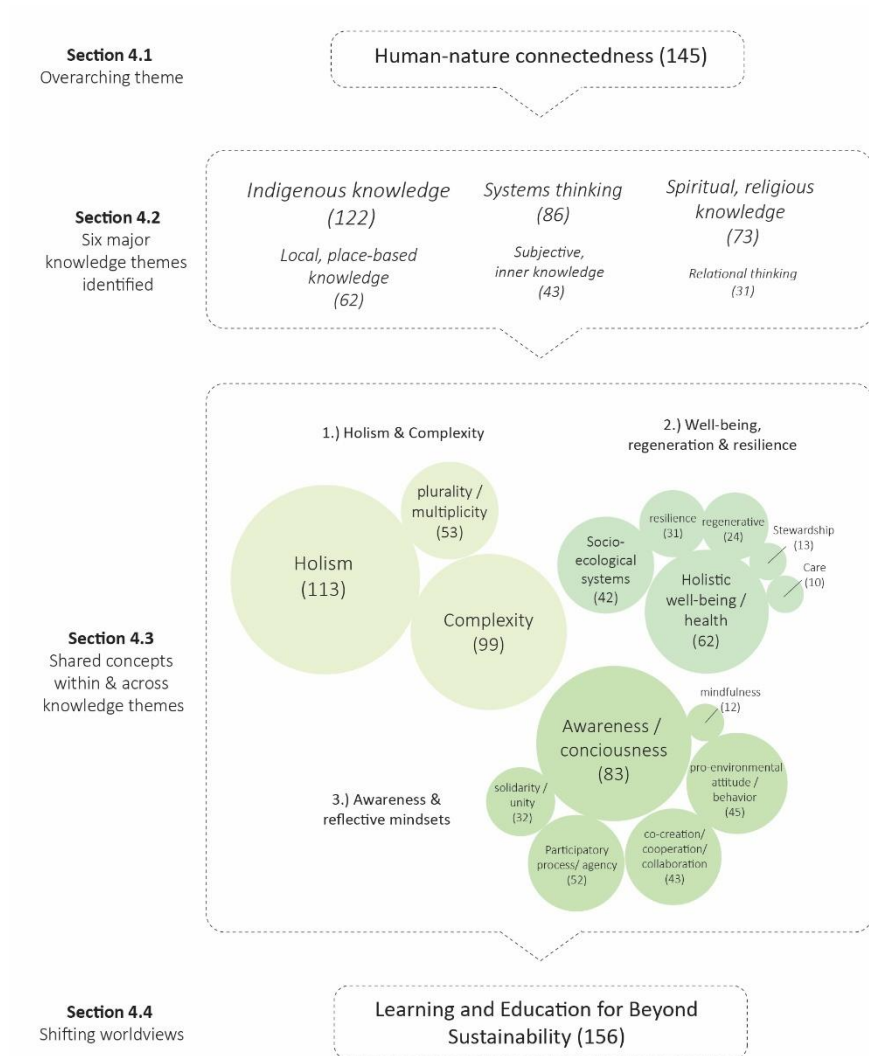


Figure 1. The results are structured through four sections. Each number corresponds to the coding frequency of a knowledge theme or concept that was found during the QCA. For example, there were 86 papers that discussed systems-thinking, 99 papers that discussed complexity, etc. Circle size and font size are proportional to different frequency ranges (1-15, 15-35, 35-55, 55-75, 75-100, 100+). Figure 1 can be downloaded as high-resolution PDF file at: <https://www.ojs.unito.it/index.php/visions/article/view/7309>

Likewise, much of the concepts used in the following sections are loaded with different meanings depending on discipline or cultural worldview. For example, a wide range of terms were used in the literature to describe worldviews that both support and contrast deep human-nature connectedness (Table 2). Similarly, many new worldview classifications were proposed (Table 3). These results validate the points raised in Section 2, that there is a tendency within sustainability discourse to overclassify and oversimplify worldviews as “sustainable” or not. This raises critical questions of how much language, new frameworks and other forms of communication either contributes to greater plurality or potentially causes further confusion and polarization, which is elaborated on in the discussion section of this paper.

Terminology used to support and contrast human-nature connectedness

| <i>Contrasting terminology</i> | <i>Supporting terminology</i> |
|--------------------------------|---------------------------------|
| Colonial (30)* | ecological (59) |
| Western (25) | Indigenous (49) |
| mechanistic (24) | environmental (43) |
| modernist (23) | integrative (36) |
| reductionist (14) | holistic (25) |
| anthropocentric (13) | New Environmental Paradigm (14) |
| technocratic (12) | organic (14) |
| Dominant Social Paradigm (11) | eco-centric (12) |
| traditional (11) | sustainable (12) |
| individualistic (7) | egalitarian (8) |
| rationalist (4) | post-humanist (7) |
| Dominant Western Worldview (2) | eco-spiritual (5) |
| | biocentric (5) |

*Numbers reflect frequency within coded abstracts

Table 2. Terms identified within the reviewed literature that were used to contrast and support human-nature connectedness. The numbers correlated with the frequency in which the terms appeared in the coded abstracts.

"Ideal-Typical" worldview classifications used in the literature

| <i>Humans & nature disconnected</i> | → | | <i>Human-nature connectedness</i> | Reference |
|---|-----------------|----------------------|---------------------------------------|--|
| Fatalist | Hierarchical | Individualist | Egalitarianist | (Chuang et al., 2020; Ekener et al., 2018) |
| Pragmatist | Post-Positivist | Constructivist | Transformative | (Hakkarainen et al., 2020) |
| Traditional | Modern | Ecological Intensive | Holism | (Cayre et al., 2018) |
| Traditional | Modern | Post-modern | Integrative | (de Witt, 2014; van Egmond & de Vries, 2011) |
| Traditional | Modern | | Post-secular | (Gale et al., 2019) |
| Modernist | Post-modernist | | Integral | (O'Brien & Noy, 2015) |
| Defying | Non-inclusive | | Inclusive | (Coscieme et al., 2020) |
| Technocentrism | Sustaincentrism | | Ecocentrism | (Whyte & Lamberton, 2020) |

Table 3. Classifications used by scholars to conceptualize the degree of human-nature connectedness based on different “ideal-typical” worldviews. Some authors referenced four worldviews types while others used only three.

4.2: Six identified knowledge themes

During the QCA, six broad knowledge themes were identified. The terms used to describe each knowledge theme were derived from the literature: for example, as illustrated in Figure 1, there were 122 abstracts referencing “Indigenous knowledge,” 86 abstracts discussing “systems-thinking,” etc. These knowledge themes are not meant to be mutually exclusive, but rather demonstrate relationships between different ways of reasoning based on shared concepts (Figure 2). Some knowledge themes intersect more than others, depending on disciplinary or cultural origin. For instance, as shown in Figure 2 and Section 4.3, Indigenous knowledge and local, place-based knowledge contain the most overlap in how concepts are described. Similarly, spiritual and religious knowledge is often referenced as a dimension of Indigenous knowledge. However, authors also discuss ideas from Western religions and non-Western spirituality that are not specified as part of Indigenous knowledge. Overall, subjective and inner knowledge is discussed with less context specificity and is referenced primarily within environmental education, environmental psychology, and sustainability science. Relational knowledge is primarily situated within literature from the humanities, often based on ideas found in Indigenous knowledge. In contrast, the literature on systems-thinking is significantly positioned through a Western, scientific lens, specifically from social-ecological systems research, environmental sciences, and sustainability science. Even

though there is significant overlap within systems thinking and relational thinking, scholars have been recently unpacking the differences and potential implications for sustainability transformations (Raymond et al., 2021; Walsh et al., 2020; West et al., 2020).

Indigenous knowledge

The reviewed literature reflects the increasingly urgent and long overdue call within academia to recognize Indigenous and traditional ecological knowledge as fundamental in reshaping the narratives around sustainability (Belfer et al., 2017; McPherson et al., 2016; Ranta, 2018). Many Indigenous authors use Indigenous as an umbrella or “placeholder” term to encompass non-colonized ways of knowing and being from non-migratory ethnic cultures (Stewart, 2018). In general, Indigenous worldviews are grounded in a deep, place-based understanding that all beings are holistically and intrinsically interconnected (Gray, 2016; Russell & Ens, 2020). However, the depth of Indigenous knowledge has yet to reach a widescale representation in peer-reviewed sustainability literature (Belfer et al., 2017). Scholars highlight one reason for this gap is the inability to translate much of Indigenous wisdom into Western, English-speaking formats (Belfer et al., 2017; Lacombe, 2010; Tafoya, 2020). Others argue that maintaining the globally dominant Western paradigm has been at the expense of legitimizing many other realities, like Indigenous knowledge (Boetto, 2019; dos Martins, 2010; Kochetkova, 2005). Furthermore, Indigenous knowledge is still largely considered a way to confirm scientific evidence, rather than being intrinsically valuable in itself (Belfer et al., 2017).

Local, place-based knowledge

Local, place-based knowledge is often discussed in relationship with Indigenous knowledge as an approach to decolonize dominant sustainability paradigms (Opoku & James, 2021). Some authors consider Indigenous and local knowledge (ILK) as a "body of thought that embraces all knowledge systems and legitimizes ILK holders" (Chilisa, 2017: p. 814). Others define ILK as a situated and adaptive collective identity shared across social and spatial networks (Lam, Hinz, et al., 2020). Scholars also discuss local knowledge as a perspective that intertwines place, culture and nature (Beilin & Bohnet, 2015; Briggs et al., 2019). Yet Lam et al. reiterate that local knowledge lacks comprehensive definitions and positioning outside the realm of Indigenous knowledge (2020). Despite the ambiguity of the concept, much of the literature highlights the need to reconnect with and further

legitimize local, place-based and traditional knowledge sources as pathways towards sustainability (Lukasiewicz et al., 2013; Timoti et al., 2017).

Systems-thinking

Systems-thinking is a way of reasoning that aims to understand the relationships and interactions between parts and whole (Amissah et al., 2020). There are different interpretations of systems-thinking that are linked to different disciplines, derived from complexity sciences, cybernetics, general systems theory and systems dynamics (Buchanan, 2019; Midgley, 2016). However, the dominant perspective within the reviewed literature considers systems-thinking as a holistic understanding of reality, where complex interactions between components and environments are open, continuous, and self-regulating through feedback loops (Dori et al., 2019; Melo, 2020). Many authors also consider systems-thinking a way of decision-making and taking action within uncertain and complex change processes (Monat & Gannon, 2015; Reynolds & Holwell, 2020). Systems-thinking is recognized as a core approach in understanding the complexity of sustainability transformations, based on historical concepts like Miller's living systems concept and Lovelock and Margulis' Gaia hypothesis (Mang & Reed, 2012; Yablokov et al., 2017).

Spiritual, religious knowledge

A notable amount of the literature calls for greater recognition of the role of spirituality and religion in conceptualizing sustainability, especially with regards to values (Gray, 2016; Ives & Kidwell, 2019). Most of this literature remains at a conceptual level discussion and is often connected to inner or subjective knowledge (Grenni et al., 2020; Woiwode et al., 2021) and Indigenous knowledge (Gould et al., 2021; Russell & Ens, 2020). Although much of the literature related to spirituality and sustainability is limited to Judeo-Christian contexts, some scholarship focuses on "Eastern" philosophies as an alternative to reductionist worldviews (Dong et al., 2010; Zidny et al., 2020). Several scholars expand beyond "Eastern" as a blanket term and discuss ways in which Buddhist (Brown, 2018 and Song 2020), Confucian (Liu & Constable, 2012; Mok, 2020; Sjöström, 2018), and Taoist (Alterado, 2015) practices can enhance multiple understandings of sustainability. For example, within Daoism and the Ilokano concept of cosmic self, silence is a critical practice for communicating between self and the cosmos, in which the "inner voice" of nature can be heard (Alterado, 2015).

Subjective, inner knowledge

Although less represented within the literature, there are calls for greater research on the subjective and inner dimensions of sustainability (Hakio & Mattelmäki, 2019; Horlings, 2015; Ver Steeg, 2020; Wamsler & Brink, 2018). Scholars emphasize the importance of valorizing personal experiences of sustainability (Marujo et al., 2019; Tillmanns, 2020) and the need to better negotiate how subjective and objective realities could come together (Eckersley, 2016; Steelman et al., 2019). Increasing self-awareness is seen as a key practice to help individuals make sense of their place within a holistic system (Biberhofer et al., 2018; Hakio & Mattelmäki, 2019). Similarly, interactive sharing of individual experiences can help reframe “otherness” as an opportunity to connect, rather than divide (Steeleman et al., 2019). Others highlight the conundrum of how little attention personal experience and place-based, local knowledge is considered within the design of environmental policies (Lukasiewicz et al., 2013). Much of the reviewed literature on the inner dimension references ancient concepts that have been continually practiced in non-Western communities, such as mindfulness, derived from the Zen practice of Mahayana Buddhism (Ericson et al., 2014). Mindfulness is considered a growing practice within sustainability education and climate change adaptation (Geiger et al., 2020; Wamsler et al., 2018) as well as pathways for linking pro-environmental attitude and behavior and reducing consumption (Grabow et al., 2018).

Relational thinking

A small amount of the reviewed literature reflects the emerging emphasis on relationality in sustainability discourse. Relationality’s growing popularity has resulted in different and often misaligned meanings (Walsh et al., 2020). Nonetheless, relational perspectives consider reality as an assemblage of entities that are continuously evolving through embodied and interconnected experiences (Alexander, 2016; West et al., 2020). Relationality has been predominately positioned within social science and humanities research to describe non-anthropocentric perspectives that give agency to non-human entities (Haraway, 2015; Latour, 2015) yet much of the philosophies are based on ancient concepts across Indigenous knowledge (Panelli, 2010; Whyte, 2020).

| Overall Theme: Human-nature connectedness | | | |
|---|---|---|---|
| Identified knowledge theme | Shared concepts within & across knowledge themes | | |
| | 1.) Holism & Complexity | 2.) Well-being, regeneration & resilience | 3.) Awareness & reflective mindsets |
| <i>Indigenous knowledge</i> | All beings are holistically interconnected and continuously evolving in embodied relationships (Gray, 2016; Russell & Ens, 2020). | Holistic well being is practiced through sacred Indigenous cosmologies and intergenerational knowledge transfer (Diver et al., 2019; Gould et al., 2021). | Human needs are guided by "kinship" or "kincentric" awareness to strive for harmonious interactions with all aspects of nature (Kimmerer, 2012; Boehnert, 2018; Russell & Ens, 2020). |
| <i>Local, place-based knowledge</i> | Local and place-based knowledge is a situated understanding of holistic, biocultural diversity (Briggs et al., 2019). | Well-being is informed by place-based, emergent process rather than predetermined meanings (Tadaki et al., 2017; Peçanha Enqvist et al., 2018). | Relationships with place are active rather than passive: it is a moral responsibility to care for the surrounding environment (Chapin et al., 2011). |
| <i>Relational thinking</i> | Relationality is a way of understanding the reciprocal betweenness of human and non-human actors (Akama, 2014; Alexander, 2016). | Relational caretaking of nature is considered a virtue and one that gives meaning back to self (Riechers et al., 2020; Pascual et al. 2017). | Critical reflection through relational processes expand awareness of the many ways agency can be expressed, especially in non-human entities (Barrett et al., 2017; Tillmanns, 2020). |
| <i>Systems thinking</i> | Complex interactions between components and environments are open, emergent, continuous and self regulating through feedback loops (Doni et al., 2019; Melo, 2020). | Social ecological systems resilience is measured by the extent of adaptive and transformative capacities to support continued "human well being" (Folke et al., 2016). | Systems thinking can be considered as a practice or state of mind to continuously re-align human goals with that of the rest of nature (Mang & Reed, 2012; Reed, 2007). |
| <i>Inner, subjective knowledge</i> | The inner self and the broader world are interconnected as a complex and dynamic entanglement of actors" (Aedo et al., 2019). | Flexible and adaptive capacities can lead to increased resilience and deliberate engagement in sustainability transformations (Gram-hanssen, 2019; Luthé & Wyss, 2015). | Making a connection between one's inner understanding of self and outer behaviors can lead to greater awareness of one's role within the world (Hakio & Mattelmäki, 2019; Biberhofer et al., 2018). |
| <i>Spiritual, religious knowledge</i> | Wholeness with the cosmos is emphasized through consciousness of self, transformative capacity and "radical complexity" (Kohler et al., 2019; Gray, 2016). | Concepts like dark green religion and deep ecology consider the well-being of all life forms as philosophical and sacred practice (Conty, 2019; Koehrsen, 2018). | Revitalizing spiritual aspects like enchantment, awe and wonder within the cosmos can help build empathy for other species (Taylor et al., 2020; de Witt, 2014). |

Figure 2: Within the overarching umbrella of human-nature connectedness, each knowledge theme (systems-thinking, spiritual, religious knowledge, etc.) has diverse interpretations of shared concepts: 1. Holism & complexity; 2. Well-being, regeneration, and resilience, 3. Awareness & reflective mindsets. This is illustrated through a matrix of 18 examples from the literature. (Figure 2 can be downloaded as high-resolution PDF file at: <https://www.ojs.unito.it/index.php/visions/article/view/7309>)

Relational perspectives can be effective in reframing human-nature connectedness as “process ontologies” rather than fixed states (Hertz et al., 2020).

4.3 Shared concept clusters

The following section describes how the three shared concept clusters are manifested across the six knowledge themes. Developed from the QCA results, the matrix in Figure 2 illustrates the co-occurrence of three concept clusters, six knowledge themes, and the overarching theme of human-nature connectedness through 18 examples from the literature. The relationships between these themes and concepts are further elaborated on the following sections.

Holism and Complexity

In addition to human-nature connectedness, holism and complexity are identified as key conceptualizations of sustainability across the six knowledge themes. Indigenous knowledge contains the most expansive understandings of these concepts, in which the entirety of an individual (spiritual, intellectual, physical, emotional) is interconnected with all other living and non-living entities through evolving relationships (Sharma & Kanta, 2021; Stewart, 2018). Metaphors and stories are often used to understand the complexity of these interactions, reconcile conflict, and reevaluate priorities (Fonseca-cepada, 2019; Timoti et al., 2017). Like a metaphor, the concept of place in both Indigenous and local knowledge is considered a contextual manifestation of complex human-nature interactions (Lam, Hinz, et al., 2020).

Within the discourse on spirituality and religious knowledge outside a specified context of Indigenous knowledge, scholars discuss the need for more holistic philosophies that connect a “consciousness” of self with the broader cosmos (Kohler et al., 2019). For example, the Confucian concept of *qi*, or the holistic force that brings harmony to all life, can offer a pathway for individually and collectively reconnecting to nature (Mok, 2020). Similarly, texts focusing on subjective and inner knowledge advocate for more awareness of the complex relationships between self and broader realities (Aedo et al., 2019). Some conceptualize this as the noosphere, or the evolving interactions between human consciousness and broader anthropocentric activity (Grachev, 2018).

Likewise, systems-thinking perspectives are based on complexity and part-to-whole relationships (Espinosa et al., 2008; Sterling, 2003). Yet within the literature, systems-thinking is considered more as a tool to address complex challenges, such as the ice-berg model and leverage points perspectives

(Davelaar, 2021; Fischer & Riechers, 2019) which contrasts the more embodied ways of understanding complexity in Indigenous knowledge (Heke et al., 2019). While some authors suggest that the basic principles of systems-thinking are similar to Indigenous knowledge such as emergent and open part-to-whole relationships; (Ali et al., 2021), others argue that systems-thinking ultimately tends to abstract complex understandings of reality, whereas Indigenous knowledge and some forms of local knowledge cannot be truly understood outside lived experience (Goodchild, 2021).

This connects with recent debate on the nuances between systems-thinking and relational knowledge (Walsh et al., 2020; West et al., 2020). Some authors argue that relational worldviews differ from a systems-approach in that there is less emphasis on the entities themselves, and rather greater focus on the betweenness of reciprocal processes (Akama, 2015; Latour, 2017; Stenseke, 2018). For example, systems-thinking literature describes complex adaptive systems as autopoietic, or self-organizing, in which their own components are continually reproduced over time (Onori & Visconti, 2012). However, relational thinking is supported by a sympoietic process, or the collective process of being and becoming through togetherness (Collett et al., 2020; Haraway, 2015) which is also substantially present in Indigenous knowledge.

Well-being, regeneration, and resilience

In addition to the complex and holistic dimension of human-nature connectedness, the literature broadly describes the normative aspects of these relationships as well-being (Laininen, 2018; Strunz et al., 2019). Well-being is considered both a subjective, values-based concept as well as a functional metric in maintaining healthy social-ecological systems (Salonen & Konkka, 2015). Well-being is broadly described through a sense of collective equity and inclusivity (Paulson, 2017) cultural values (Towler et al., 2019), a focus on degrowth and ecospirituality (Lestar et al., 2020; Paulson, 2017) and multi-species well-being (Parsons et al., 2017; Rupprecht et al., 2020; Treves & Lynn, 2019).

Many scholars describe the active role humans have in contributing towards holistic well-being (Chapin, Power, et al., 2011; Peçanha Enqvist et al., 2018; Weller, 2014). Within sustainability science, this concept is commonly regarded as stewardship (Mathevet et al., 2018). Although the term itself was underrepresented within the literature, the concept is present across several knowledge themes, which relates to broader calls to expand siloed understandings of stewardship (Chapin, Pickett, et al., 2011). For example, from the literature concerning spiritual and philosophical perspectives, Arne Næss's

deep ecology principles (Lie & Wickson, 2011) and Aldo Leopold's "land ethic" (Hourdequin, 2017; Keong, 2016; Mayer, 2018) both recognize human's responsibility to respect nature's own agency.

These ideas of moral obligation and care for nature are also deeply present within Indigenous knowledge, yet have a greater emphasis on reciprocity (Abram, 1996; Akama, 2014). In contrast to Western concepts of scarcity and competition, Indigenous perspectives emphasize the abundance that nature offers – gratitude is seen as an intrinsic motivator for "giving back" (Coscieme et al., 2020; Diver et al., 2019; Kimmerer, 2012). For example, caring for the Waipā river (in what is now called New Zealand) acts as the spiritual, cultural, and ecological core of the Maniapoto tribe's identity and well-being (Parsons, et al., 2017).

This relates to how relational understandings of multi-species equity, egalitarianism, and collaboration are discussed within the literature (Alberro, 2020; Haraway, 2015; Plumwood, 2001). Inspired by Indigenous knowledge, relational caretaking of nature is considered a virtue and gives meaning back to self (Pascual et al., 2017; Riechers et al., 2020). This is often described as care ethics, "caring for" and "caring about" nature (Bellacasa, 2011; Dooren, 2014; Moriggi et al., 2020).

On the other hand, authors tend to describe systems-thinking with a more indirect relationship to well-being. Systems-thinking is not intrinsically normative, yet it has the potential to contribute towards more regenerative cultures that support emergent, healthy human-nature networks (Duarte Dias, 2018; Mang & Reed, 2012; Swat et al., 2019). Broadly speaking, regenerative cultures are based on context specific "living systems" or "whole systems" that actively aim to restore past damages and reconcile separation from nature (Capra, 1996; Cole, 2012; Gibbons, 2020). This corresponds to how place-based knowledge considers regeneration as evolving and interlinked processes across temporal and spatial scales, rather than preconceived outcomes (Benne & Mang, 2015). For instance, the "satoyama" Japanese biocultural landscapes are specific contexts in which humans are active participants in regenerating water cycles, rice production, fish habitat and social belonging to the land (Chakroun et al., 2020).

Furthermore, the literature also discussed aspects of social-ecological systems research and resilience as key dimensions of conceptualizing sustainability (Jones & Comfort, 2018; Rogers et al., 2020; Zanotti et al., 2020). The literature defines social-ecological systems (SES) as the resilient and continuous interaction of biophysical and social factors (Everard, 2020). SES resilience is measured by the

extent of adaptive and transformative capacities to support continued “human well-being” (Folke et al., 2016). Despite the holistic lens, authors argue that the historically anthropocentric focus in SES research has excluded the agency of non-human actors (Contesse et al., 2021). Likewise, scholars advocate for more place-based and biocultural emphasis on SES resilience indicators (Dacks et al., 2019; Zanotti et al., 2020) and the inclusion of more subjective dimensions like emotion, consciousness or agency (Reid & Rout, 2018). For example, authors highlight how Indigenous knowledge intrinsically incorporates these aspects by conceptualizing resilience as a flexible and participatory process that weaves mind, body and spirit with broader non-human networks (Salmón, 2000; Timoti et al., 2017).

Finally, the literature also emphasizes social and cognitive dimensions of resilience as important adaptive capacities in supporting holistic, regenerative societies (Luthe & Wyss, 2015; Marschütz et al., 2020). Within the discourse on inner and subjective knowledge, scholars argue that more effective processes are needed to accept uncertainty and prepare for change, rather than only reacting to it (Bartels et al., 2020; Rawluk et al., 2019; West et al., 2020). Communities with high levels of flexibility and diversity are more prepared for deliberate engagement in shaping sustainability transformations, which increases resilience (Gram-hanssen, 2019; Luthe & Wyss, 2015). Such a process can be cultivated by building personal and collective trust to maintain a sense of purpose, regardless of external factors (Eriksson & Lindström, 2014; Laininen, 2018; Woiwode et al., 2021). Similarly, mindfulness practice has become a recognized way of building mental resilience, by channeling emotions like empathy and compassion during both periods of disturbance and stability (A. H. de Witt, 2016; Gómez-Olmedo et al., 2020; Wamsler, 2018).

Awareness and reflective mindsets

In line with building cognitive resilience, there is substantial emphasis on the need to cultivate the awareness of human-nature connectedness, as the first step towards expanding worldviews (Ruiz-Mallén & Heras, 2020). Across the different knowledge themes, awareness and critically reflective mindsets are broadly framed as key competencies for reconciling relationships with nature (Aedo et al., 2019; Laininen, 2018; Thiermann & Sheate, 2020).

Within the literature on inner and subjective knowledge, scholars support critical reflection and awareness as core skills for adapting in times of uncertainty, such as dealing with discomfort and lack of control (Aedo et al., 2019). Specifically within mindfulness research, compassion and present-state awareness are

emphasized as pathways to reconnect to nature (Doran, 2013; Ives et al., 2020; Siqueira & Pitassi, 2016).

Likewise, scholars consider spiritual and religious concepts like enchantment, awe and cosmic wonder as ways to revitalize empathy for other species (A. H. de Witt, 2014; B. Taylor et al., 2020) and support opportunities for greater belonging (Allevato, 2018; Johnston, 2018). Awareness and agency are often described together within the literature. For example, spiritual well-being with the environment is based on active participation (Aniah & Yelfaanibe, 2018) and “ecosophy” principles advocate for achieving ecological harmony through the combination of consciousness and action (Drengson et al., 2011; Lie & Wickson, 2011). Yet authors also discuss the limitations of religion and pro-environmental attitudes in that they don’t necessarily lead to transformative behavioral change (Corral-Verdugo & Frías-Armenta, 2016; Ives & Kidwell, 2019; Nash et al., 2020). On the other hand, scholars argue that philosophies like degrowth, anti-materialism and frugality within the eco-spirituality discourse are effective pathways towards transformative action (Koehrsen, 2018; Lestar et al., 2020).

Such entanglement between awareness and agency is strongly represented within the literature on Indigenous knowledge. Human needs are guided by “kinship” or “kincentric” awareness of all other non-human needs as a collective process in maintaining harmony with nature (Kimmerer 2012; Boehnert 2018; Russell and Ens 2020). Similarly within relational thinking, authors describe how engaging in multi-species care practices can cultivate a greater sense of “biophilic consciousness” and willingness to share resources (Fernández-Herrería & Martínez-Rodríguez, 2016).

Similarly, scholars describe how human activity adapts to accommodate the needs and inherent agency of a particular place, such as with Indigenous fishing practices (Diver et al., 2019). In terms of local and place-based knowledge, the literature discusses place as both a physical territory and a “terrain of consciousness” in how to live appropriately in that particular environment (Lynch, 2016; B. Taylor, 2000).

Although much of the systems-thinking literature tends to focus on problem-solving complex issues, it can also be considered a practice or mindset to re-align human goals with that of the rest of nature (Mang & Reed, 2012; Reed, 2007). Rather than seeking control, awareness of the whole through question-based rather than answer-directed approaches can help people adapt appropriately to new contexts as they arise (Senge, 1999; Wahl, 2016). Ultimately, such

reorientation towards a culture of questioning requires shifting the dominant, solution-oriented worldviews through processes of learning (Barrett et al., 2017).

4.4 Redefining worldviews through (un)learning

In addition to these six predominant knowledge themes and shared concepts throughout, a substantial portion of the literature centers around reframing both students' and educators' worldviews through various methods and pedagogical models. While much of the texts concentrate on specific contexts outside the scope of this paper, there are several aspects that are useful to communicate: the types of learning that can help shift detrimental worldviews towards those that support greater human-nature connectedness.

Scholars advocate that learning should receive greater attention within sustainability transitions research as it is the foundation for understanding the complexity of variables involved (van Mierlo et al., 2020). Different learning types can be used to shift unsustainable, materialist outlooks towards holistic worldviews based on curiosity, creativity, and compassion (Geiger et al., 2020; Ives et al., 2020). For example, the most supported types for reframing worldviews are social and transformative learning (Bjerkan & Ryghaug, 2021; Pel et al., 2020; Yee et al., 2019). Both of these methods encourage critical reflection for determining how new knowledge shapes one's own worldview and drives behavioral change (Boström et al., 2018; Lange, 2004, 2019). In relational scholarship, reflexive learning can help recognize the plurality of ways in which agency is expressed, especially in non-human entities (Aedo et al., 2019; Barrett et al., 2017; Tillmanns, 2020).

Likewise, within much of the literature related to Indigenous and local knowledge, scholars are increasingly advocating for more context specific, place-based learning. Community-based, participatory, and experimental learning within local and outdoor settings raises awareness about how different worldviews co-exist and helps to transcend artificial binaries between humans and nature (Herman et al., 2021; Paulus, 2016; Sumida Huaman et al., 2019). These types of "life-place learning" (Thayer, 2003) or "learning in place" (Williams et al., 2018) offer opportunities to rediscover traditional ways of knowing and "un-learn" destructive and exploitive assumptions based on dominant, reductionist worldviews (Laininen, 2018).

5. Discussion

This review paper offers readers an overview of current peer reviewed literature on different knowledge themes and concepts that constitute worldviews beyond sustainability. From the subjectivity of inner or spiritual knowledge to the objective ideals of systems-thinking in sustainability science, each of these knowledge themes can have a role in reconnecting ourselves with nature and engaging within sustainability transformations. The following sections unpack the relationships between gaps and limitations, discuss the results, offer the author's self-reflective worldview, and suggest future research avenues.

5.1 *Research Gaps*

Despite the vast amount of literature reviewed, there are noteworthy gaps within the research around worldviews and sustainability. Technocentric and socio-technical perspectives on sustainability, especially within transitions research, were lacking. For example, there was almost no mentioning of core concepts like scaling-up and out technological innovation, despite the broad keyword search of "worldview and sustainability." Additionally, subjective interpretations of sustainability such as mindfulness and inner spirituality were primarily situated within education for sustainability and strategies to reduce consumption, lacking association with broader and more diverse contexts. Only a few texts discussed spiritual and philosophical perspectives from Confucianism, Buddhism, and Taoism, even though concepts found within these practices are relevant to the discussion around worldviews and sustainability. Also lacking were more detailed posthumanism and ecofeminism perspectives, beyond general references to seminal texts. Likewise, there was almost no mentioning of design-based or artistic perspectives. Although there was substantial discussion of Indigenous knowledge within the literature, it is critical to highlight the underrepresentation of non-Western, non-academic, and non-English speaking voices. Even though authors can attempt to communicate Indigenous knowledge through peer-reviewed articles, dominant Western methodologies and formats can exclude embodied and non-written forms of knowledge (Parsons et al., 2017).

These gaps relate to the objectives of this review paper: to understand what kind of discourse is being included on worldviews and sustainability within peer reviewed literature in the academic system and how this can expand awareness on the limits of what can be known about worldviews.

5.2 Methodological Limitations

The established methodology of quantifiable keyword searches in peer-reviewed databases represented an accessible choice for the author to scan a large amount of literature within a defined scope, considering time, language, and resource constraints. However, this accepted scientific method limits the diversity of knowledge that could be included in such a review. While this method can function well for specific topics within defined disciplinary boundaries, the complexity of worldviews and related transdisciplinary concepts around sustainability challenges the effectiveness and appropriateness of quantitative databases searches. What do these broadly accepted methods say about our own worldviews as researchers, and the academic system at large? The peer-review publication process itself requires certain kinds of worldviews based on certain credentials achieved through certain institutions. Knowledge-holders who do not conform with these standards tend to be excluded, despite the growing focus for more transdisciplinary and participatory approaches for academic research.

While this review paper represents only a small window of knowledge, this can act as a starting point in gaining awareness of the limitations of how worldviews are discussed within the academic system. This also relates to the author's own worldview and inherent limitations.

I am a trained architect, teacher, and systemic design academic who values self-reflection and self-exploration. I also identify as a Western, white person in a privileged position to contemplate these ideas. Both the subconscious and conscious understanding of my own worldview limits what I can understand about other worldviews. For example, my position within a design institution has influenced the choice to explore both the value and limitations of quantitative research methods, like database searches. I aim to continuously acknowledge my privilege, my limitations and expand my worldview to be as inclusive as possible, especially by actively engaging with and learning from others who hold identities and worldviews that are different than my own.

For future research with greater funding and institutional support, the author strongly advocates for expanding on the vastness of worldviews and sustainability by involving an equally wide range of practitioners and non-academic partners, especially from non-Western contexts like the Global South and members of Indigenous communities. Likewise, disseminating such knowledge through a broader selection of formats outside of peer-review articles, such as podcasts, artistic performances, or visual didactics, can help expand the worldviews of all involved.

5.3 Discussion of results

Considering these limitations, a main observation of the reviewed literature is both the broad consensus on human-nature connectedness as an overall dimension of sustainability and the disciplinary and cultural differences in how this theme is conceptualized. Generally, the primary tensions lie in striving for factual, quantifiable measures of sustainability versus understanding sustainability through collective/individual perceptions and embodied, lived experiences. For example, most literature on resilience from a systems-thinking perspective remained in the “out there” context and did not link between research related to cognitive resilience, such as mindfulness. Maintaining the evidence-based and quantifiable outputs of science is needed to guide some aspects of sustainability transformations, like calculating climate change effects on social-ecological systems. Yet other knowledge themes like relational thinking or local knowledge could help operationalize intangible dimensions for place-based and culturally specific future resilience pathways. Likewise, Indigenous knowledge offers many learnings for how resilience can be understood as a multi-dimensional, spiritual, reciprocal, and embodied practice. Finally, activating the cognitive dimensions of resilience capacities like mindfulness is critical for being able to cope with complex change processes like sustainability transformations.

This example illustrates that none of these knowledge themes necessarily have more value over the other in how resilience is conceptualized. Instead of trying to reconcile or forcibly converge such different perspectives together, perhaps an appropriate pathway would be to understand the depth and range of where knowledge themes conflict and how they are connected. For example, as presented in the results, at a micro level authors describe holism differently from a system-thinking or Indigenous knowledge perspective (abstracted versus embodied understandings). Yet at a macro level, both these knowledge themes, and the others identified in the reviewed literature, share an awareness of a common whole – that humans are part of the broader web of life. Thus, commonalities and differences depend on the degree and scale in which they are understood. Assessing concepts like holism from diverse worldviews can help reframe cultural or disciplinary boundaries as zones of connection, rather than separation. Therefore, it could be highly beneficial to cultivate more collective and inclusive processes of unpacking which knowledge themes are useful when and for what on purpose, context and actors involved.

5.4 Future research avenues

These examples represent a clear challenge – the ripple effects of reductionist thinking prevents us from being able to holistically work with different ways of knowing and operationalizing plural notions of sustainability. This could be a key direction for future research, with transdisciplinary practices like systemic design offering potential pathways to engage with this challenge. For example, scholars within systemic design are exploring how the intersections between science, design and real-world practice can be used to inform more effective strategies and methods for intervening in complex systems change (Luthe et al., 2021). Relatedly, greater attention is needed in how sustainability knowledge is validated within academic discourse and society at large. Are we able to accept that phenomena exist, even if we cannot prove its validity? For example, it was only until recently that the natural sciences have begun to legitimize “unproven” knowledge that Indigenous communities have known for millennia, such as the genetic interlacing of tree communities (Mitchell, 2018).

This also relates to a key issue in how sustainability is communicated within the reviewed literature. The results show that there is a need to clarify what sustainability is attempting to address, which relates to the ambiguity of the term itself. The normalization of “sustainability” has ironically diluted the urgency required within sustainability transformations. “Sustainability” is arguably the most generic term to reach a broad audience. Yet it acts only as an entry point towards deeper discussion: it is not sufficient to describe the complexity of human-nature connectedness. On the other hand, as shown in Tables 2 & 3, an array of different descriptors that communicate very similar ideas can lead to public confusion and apathy in reconnecting with nature. Thus, future research could explore the ways in which a plurality of worldviews can flourish while simultaneously be communicated through a common language to accelerate solidarity and action. For example, the framing of “traditional” worldviews can be confusing. Many authors use “traditional” ways of knowing to describe Indigenous epistemology, which is holistic and integrative. However, this does not align with the “ideal-typical” worldview classifications of traditional-modern-post-modern-integrative, where “traditional” stems from a Judeo-Christian set of values based on a monotheist reality where humans are managers of nature (Conty, 2019) (see Table 3). For future research, it would be useful to do a comparative analysis on how misleading words like “traditional” shape perceptions of human-nature connectedness.

Relatedly, additional future research on socio-political ideologies of diverse worldviews in relationship to sustainability would be valuable, such as

ecofeminism and its emphasis on activism and emotionally equipping people to confront interconnected social and ecological injustices (Bell et al., 2021). Likewise, future pathways for broadening worldviews and encouraging greater engagement in sustainability perspectives could include more artistic and creative perspectives. For example, many two-dimensional representations of complex social-ecological systems, such as text or system maps, are limited in their capacity to activate deep emotional and lived experiences of those systems. Expanding awareness and participation in performative and embodied experiences (such as theater, artistic ceremonies, serious games, mindful outdoor movement, etc.) could help expand understandings of how interactive and creative “warm data” (Bateson, 2018) can contribute to (un)learning processes for shifting worldviews. This could also be a future avenue for relating to emerging posthumanism research on embodied processes, specifically around connecting technological, biological and philosophical dimensions of human and non-human relationships through collective “doing-making-thinking-creating” (Taylor et al., 2023).

Activating a culture of questioning: building adaptive capacities to engage in the complex web of life

Even though sustainability science is advocating for more solutions-oriented research to bridge the knowledge to action gap (Tengö & Andersson, 2021), it is critical to recognize that this derives from a modernist worldview rather than the process-oriented approaches found in Indigenous knowledge or relational thinking (Hertz et al., 2020). Concrete short-term actions are needed to address the urgent issues at hand, but this should not hinder the parallel need to develop greater capacities to engage with emergent processes that prepare us for change - rather than only responding to its effects. Institutions themselves must cultivate the conditions for change to emerge, for example, confronting the underlying worldviews that drive academic reward systems. We need more holistic worldviews that are based on critical reflection and questioning – to learn and understand our roles in the complex systems we inhabit and continuously reframe them as new contexts arise (Wahl, 2016). Such worldviews can invite different ways of approaching decision-making in uncertain conditions – when data is evolving, unknown or can never be known, we can still take more iterative, processes-oriented actions that can more easily adapt when new knowledge is produced.

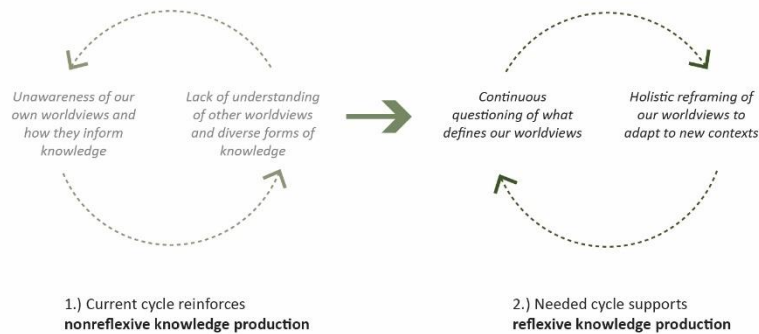


Figure 3: Within the current academic system, detrimental cycles of nonreflexive knowledge production continue to be reinforced through the lack of awareness of both one's own worldview and diverse worldviews (cycle 1). Transitioning towards a culture of continuous questioning can lead to greater adaptation and holistic evaluation of worldviews, supporting reflexive knowledge production (cycle 2). (Figure 3 can be downloaded as high-resolution PDF file at: <https://www.ojs.unito.it/index.php/visions/article/view/7309>)

This relates to an interesting challenge in generating this paper. The format of a literature review itself highlights the limitations of the academic system – papers on worldviews from scholars that align with certain worldviews have been reviewed through this author's own worldview. As much as we try to maintain a level of objectivity and replicability within the current academic system, detrimental cycles of nonreflexive knowledge production and dissemination continues to be reinforced, at the expense of non-compliant forms of knowledge (Figure 3). We can transition from this nonreflexive cycle towards a reflexive cycle by taking the time to question actively and collectively what a worldview is, how it is used in a particular context and who's worldviews are predominately voiced. This greater awareness can lead to the continuous practice of jointly reframing our worldviews on a systemic level to begin to unravel the hegemonic structures of validating knowledge. Such a process could potentially help us unlock the artificial barriers that have been preventing us from deeper connection between ourselves, each other, and nature.

Ultimately, readers are invited to thoroughly question this review paper– by doing so doesn't make it any less valid – instead, such practice invites opportunities to fully embrace the complexity, imperfection, and uncertainty of our worldviews as plural, dynamic constructs.

6. Conclusion

This review offers a detailed synthesis of an extensive amount of literature on diverse worldviews of and beyond sustainability. Research across sustainability science has increasingly advocated for greater understanding of the root causes that shape our behaviors, systems, and societies – our worldviews. While reductionist and modernist worldviews continue to dominate much of global sustainability discourse, the reviewed literature reveals a growing emphasis on the urgent need to transition towards worldviews that support deep human-nature connectedness. This paper contributes to sustainability discourse by providing an overview of current literature from different research streams, disciplines, and cultures. The results are synthesized into a collection of identified knowledge themes (Indigenous knowledge, systems-thinking, relational thinking, inner/subjective knowledge, spiritual/religious knowledge, and local/place-based knowledge) that have diverse conceptualizations of shared concept clusters: 1. holism and complexity, 2. well-being, regeneration, and resilience and 3. awareness and reflective mindsets. Likewise, key gaps from the results include a lack of emphasis on culturally diverse understandings of spiritual and inner dimensions of sustainability; an absence of a common language in describing worldviews of human-nature connectedness; and a lack of processes to holistically connect across different worldviews without oversimplifying or reinforcing detrimental power structures.

Instead of relying on outdated interpretations and furthering the distinction between ways of knowing, greater attention should be focused on the interconnectedness of ideas, theories, and methods: each has something to contribute towards a livable future for humankind and inspiring a reconnection to the broader web of life. This also suggests the need for critical awareness of when conflicting worldviews become obstacles towards human-nature connectedness. While some worldviews may “only” limit the degree of human-nature connectedness, others can also produce significantly detrimental social-ecological effects. Sustainability transformations require a systemic, societal shift in how we conceptualize our relationship with the biosphere, which requires both an individual and collective responsibility to critically reflect upon and broaden our worldviews. The plurality of knowledge themes presented in this review, coexisting in rich complexity, invites readers from all walks of life to actively participate in reframing, questioning and continuously designing their own worldviews, as a part of the larger scale systems-change needed for sustainability transformations.

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Note about Figures and Appendix

Figures 1, 2 and 3 and Appendixes A, B and C can be downloaded from the respective separate pdf files at this link: <http://dx.doi.org/10.13135/2384-8677/7309>

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