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# *Ecosystemic logos. Emerging cartographies for a complex rationality. Interdisciplinary dialogues between science, technology, nature, and culture in shaping horizons of sustainability*

## *Logos ecosistémico. Cartografías emergentes para una racionalidad compleja. Diálogos interdisciplinares entre ciencia, tecnología, naturaleza y cultura en la configuración de horizontes de sostenibilidad*

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**Abstract**
Ecosystemic logos is proposed as a novel epistemology of highly advanced culture, thus requiring the innovative transdisciplinary conceptualization of knowledge. By developing a 'transdisciplinary' perspective that maintains as analytical frameworks the theories of complexity (Morin, 2006), the ecology of knowledge (Santos, 2009) and relational ontologies (Descola, 2013), it is possible to build a conceptual map that goes beyond reductionist logics. The study analyzes knowledge interfaces, revealing methodological strategies to constitute a complex rationality that produces sustainability horizons. The entanglements of different forms of knowledge are criticized, also emphasizing the coproduction and disruption of traditional epistemological divisions. The findings confirm the value of a comprehensive approach that recognizes the multidimensionality of knowledge systems, suggesting an emancipatory reappropriation of the relationships between the human and the non-human. The study concludes by affirming the need to find a planetary ethics of co-responsibility and a radical ecosystemic intelligibility.
**Keywords:** transdisciplinary epistemology, complex systems, knowledge cartography, relational ontologies, planetary ethics.

**Resumen**
Se propone el logos ecosistémico como una epistemología novedosa de cultura muy avanzada, requiriendo, por lo tanto, la conceptualización transdisciplinaria innovadora del conocimiento. Desarrollando una perspectiva 'transdisciplinaria' que mantiene como marcos analíticos las teorías de la complejidad (Morin, 2006), la ecología del conocimiento (Santos, 2009) y las ontologías relacionales (Descola, 2013), es posible construir un mapa conceptual que va más allá de las lógicas reduccionistas. El estudio analiza las interfaces del conocimiento, revelando estrategias metodológicas para constituir una racionalidad compleja que produzca horizontes de sostenibilidad. Se critican los entrelazamientos de diferentes formas de conocimiento, enfatizando también la coproducción y la disrupción de las divisiones epistemológicas tradicionales. Los hallazgos confirman el valor de un enfoque comprensivo que reconoce la multidimensionalidad de los sistemas de conocimiento, sugiriendo una reapropiación emancipadora de las relaciones entre lo humano y lo no humano. El estudio concluye afirmando la necesidad de encontrar una ética planetaria de corresponsabilidad y una inteligibilidad ecosistémica radical.
**Palabras clave:** epistemología transdisciplinaria, sistemas complejos, cartografía del conocimiento, ontologías relacionales, ética planetaria.

## Introduction

### Dialogue as the Foundation of Ecosystemic Logos

Today's civilizational crisis calls for a fundamentally new way of thinking about how different fields of human understanding intersect. This paper argues that dialogue serves as the essential foundation for an ecosystemic logos—a framework in which knowledge emerges from the integrative and transformative intersections across disciplines. Inter- and transdisciplinary discussion extends science, technology, nature, and culture to the generative core of how sustainable horizons become possible in a globally divided world marked by overspecialization and narrow disciplinary perspectives. As Edgar Morin (2006, p. 143) points out, "hyperspecialization obstructs the vision of the global (which breaks down into fragments) and of the essential (which becomes diluted)." Against this complex reality, the ecosystemic logos emerges as an integrative epistemological proposal.

Building on this integrated framework, this paper investigates the dialogical encounters that arise between disparate bodies of knowledge, perceiving dialogue as more than merely juxtaposing knowledge, but rather as a transformation during which (disciplinary) boundaries become malleable and new patterns of thought emerge. For as Santos (2009, p. 182) argues, "knowledge worthy of the name has always been inter-knowledge," and it is impossible to separate any genuine knowledge from dialogical relationships with others.

The proposition of an ecosystemic logos means that science, technology, and nature—or culture—are not distinct spheres but rather intertwined dimensions of the same complex reality. According to Castro-Díaz et al. (2022), interconnections of this nature require "emergent cartographies": ways of seeing and shaping these relationships, tensions, and possibilities in contact zones through knowledge systems.

As Barth et al. (2023) demonstrate, transdisciplinary approaches and multimodal algorithms have proven to be powerful tools. They make these dialogues possible by forging hybrid epistemological spaces where different perspectives can meet without completely collapsing into one another. This dialogical mode "opens up a space" that is essential for transcending the oppressive determinism of the dominant models of monological communication that have generally prevailed in modern science, playing a major role in producing the current global socio-ecological crisis.

### Science and Nature: dialogues for a situated epistemology

The first dialogue in this series emerged as we explored the relationship between science and nature. It challenges the Cartesian division between subject and object, which has been a hallmark of modern scientific thought. This becomes particularly clear when considering the limitations of any science that is detached from the natural systems it seeks to understand.

### The objectification of nature becomes one of its themes

Nature understood purely as an object has been deeply questioned. As Descola (2013) states, this is only one of many possible ontologies—specifically, Western naturalism. Numerous indigenous and traditional cultures, in contrast, conceive of nature as a subject with intrinsic meaning. They establish dialogical relationships, as nature possesses energetic capacities for action and response at all times. Policies that effectively support their own sustainability have never been implemented.

This shift toward viewing nature as a subject with whom to have a conversation is one of the challenges in reformulating scientific practice. Charting its course in health policy, the journal publication by Anchea-Monreal et al. (2015) argued in favor of this ecology-health approach: the minor roles played by natural systems and their capacity to respond to human interventions did not behave as expected or predicted.

**Scientific Awareness of Ecology**

If science wishes to communicate with nature, it must develop a "scientific awareness." According to Morin (2006), this is not a self-indulgent whim of academia; rather, it acknowledges its own limitations more frankly than mere reflection. Science that takes its own context into account transcends the supposed neutrality of positivism to assume responsibility for a more sustainable future. The moral impetus and the means to build new futures in a sustainable way are quite evident.

Expanding on this approach, Capra and Luisi (2014) developed a comprehensive vision of the life sciences. This alternative, which reconciles modern scientific findings with a contemporary ethical vision of the human-nature relationship, is perhaps a prerequisite for overcoming what Val Plumwood (2002) calls an "ecological crisis of reason." Speciesism is the radical separation of human rationality from natural processes and animals.

The dialogue between science and nature also involves understanding that there are multiple ways of knowing that can contribute to our understanding of natural systems. In his work on spiritual ecology, Berkes (2018) has shown that knowledge. Traditional ecological knowledge provides important insights into ecosystem dynamics that Western science is only beginning to appreciate.

**Technology and Culture: sociotechnical reconfigurations**

The second thematic area examines the interface between technological systems and cultural configurations; both co-produce a mutual influence on dynamic processes. In the era in which we live, digital technology is changing all our lifestyles for better or for worse. Therefore, this dialogue is particularly relevant today, as we can investigate how technological systems themselves can catalyze efforts toward sustainability or, alternatively, present major obstacles in their path.

**Beyond Technological Determinism**

Technological determinism is a misconception that attributes to technical artifacts the autonomous capacity to shape society. On the other hand, extreme social constructivism holds that humans make technology rather than the other way around. In contrast to these two one-sided views, thinkers such as Yuk Hui (2019) propose a "cosmotecnia": this term implies the materialization of specific cosmologies, or how science functions in conjunction with different parts of the social order. It has been proposed that, in fact, ideologies, worldviews, and social relations are all mapped onto technology as material structures, but technology also incorporates certain material characteristics that condition its possible uses and appropriations.

I emphasize this point to highlight the importance of Bratton (2016), since contemporary technological infrastructures are in fact meta-structures that mix and recompose humans and non-humans, creating contracts that encompass new forms of sovereignty and control of authority.

**Situated Technologies, Technical Pluriverse**

The dialogue between technology and culture allows us to consider the existence of what Escobar (2018) termed a 'technical pluriverse,' that is, many possible technological paths, rooted in different cultural contexts. This perspective challenges the supposed universality and neutrality of conventional technological systems, revealing the situated and contingent nature of technology.

Cases of appropriate technology development, free software, or participatory design show that it is possible to build technical artifacts that respond to the specific needs and values of diverse communities. As Lagunas Vázquez (2021) argues, transdisciplinarity offers both conceptual tools for this project and methods to facilitate ways in which local knowledge can interact with specialized scientific knowledge.

This dialogical approach, therefore, recognizes the technology-culture interface as a privileged space in which to imagine and construct alternative socio-technical futures, where technological innovation emerges from a perspective of sustainability and social justice. A realization of this premise is that participatory methodologies allow for the integration of a variety of types of knowledge in the evaluation and design of socio-technical systems. In this way, they help foster solutions that are both localized and culturally appropriate, as discussed by Castro-Díaz et al. (2022).

**Nature and Culture: relational ontologies**

Regarding this third axis of dialogue, it influences how modern Western thought has engendered what Descola (2013) called the "great ontological divide," a phrase that highlights the antagonism in that philosophy that separates the human world from the rest of nature, with disastrous results for both.

**Beyond the Nature-Culture Divide**

One of the main areas criticized by the ecosystemic logos is the nature-culture divide. As Descola (2013) has shown, this divide, rather than being truly universal in nature, is merely a particular ontology that emerged with modern Western thought. Their comparative research on animism, totemism, naturalism, and analogism reveals the multiple frameworks available for understanding the relationship between human society and its environment. The relational ontologies of many indigenous cultures offer an alternative to the nature-culture divide. The approaches of Castro-Díaz et al. (2022) bear witness to this. They recognize that non-human agencies can have an effect, with the result that life becomes for them simply a series of connections in which the event or occurrence is just another point among many others.

**Hybrid Territorialities and Multispecies Assemblages**

This hybridization of nature and culture has given rise to what we might call "hybrid territorialities," areas where human activity and ecological processes intermingle in all sorts of complex ways. These are what Latour (2007) refers to as "hybrid assemblages," where human and non-human actors work together to produce certain socio-ecological realities.

The framework of "multispecies studies" (Tsing, 2015) provides tools for analyzing such assemblages, revealing the complex interplay of symbiosis, competition, and coevolution among different forms of life. This is particularly relevant in the Anthropocene era, when human influence now extends to nearly all ecosystems on Earth, giving rise to diverse socio-ecological configurations. As Arenas-Monreal et al. (2015) discovered in their research on ecosystem health, these hybrid territorialities require knowledge from diverse disciplines and cultures to come together in order to be explained. It is an admission of impossibility

**Science and Culture: toward cognitive justice**

The fourth theme of the dialogue delves into an analysis of the scientific systems that permeate cultural environments. It challenges the hierarchies of knowledge that have favored knowledge derived from Western scientific practices over other ways in which people know and are in the world. For Santos (2009), this dialogue is fundamental to advancing toward what he calls "cognitive justice," a necessary condition for any genuine project of social justice.

**Ecology of Knowledge and Intercultural Translation**

The notion of the "ecology of knowledge" (Santos, 2009) is a basic framework that allows us to reevaluate the relationship between scientific knowledge and cultural diversity. It recognizes the irreconcilable plurality of knowledge and advocates for its pragmatic articulation around concrete problems, so that no set is reduced to another.

The dialogue between science and culture also requires what Santos calls a "process of translation." It is necessary to facilitate communication between different universes of meaning, without reducing them all to a common language that would inevitably lose its specificity. As Castro-Díaz et al. (2022) argue, this work of translation is crucial in Latin American contexts characterized by great cultural and ecological diversity.

**Citizen science and situated knowledge**

Initiatives in citizen science and people-centered science are promising spaces for a broader dialogue between scientific systems and diverse cultural environments. These approaches recognize the value of local and experiential knowledge, integrating it into the cooperative process of studying questions relevant to the community.

As demonstrated by the work of Arenas-Monreal et al. (2015) on participatory health assessment, the combination of scientific and community knowledge allows for a richer, more situational understanding of problems and their causes. It can lead to more effective interventions that are better adapted to the culture in which they are implemented. The concept of "situated knowledge" proposed by Donna Haraway (1988) offers a valuable perspective for this dialogue, recognizing that all knowledge is produced from particular positions within social, cultural, and ecological networks. This perspective challenges the supposed neutrality and universality of scientific knowledge, revealing its partiality and situated nature, without falling into absolute relativism.

**Cartographic Methodologies for Interdisciplinary Dialogue**

Knowledge cartographies are tools for visualizing and facilitating the complex dialogues surrounding the thinking that is shaping the ecosystemic logos. These methodologies allow us to capture connections, conflicts, and emerging possibilities at the interfaces between different knowledge systems. They create spaces for navigating complexity.

**Mapping Complexity**

Mapping complexity involves efforts to explain the multiple dimensions and interrelationships that characterize today's socio-ecological systems. As Morin (2007) points out, complex thinking posits that we need tools that represent both unity and diversity, continuity and discontinuity, and the emergence and necessity of these systems. These cartographies go beyond linear and reductionist logic, adopting reticular, rhizomatic, or fractal formats that show multiple levels of organization and nonlinear processes. As explained by Castro-Díaz et al. (2022), such visualizations allow for the identification of critical points where small interventions can trigger major systemic changes that emerge from them.

**Participatory Mapping and Territorial Knowledge**

Participatory mapping is a methodology that combines various types of knowledge in the description and understanding of a geographic region. These approaches recognize that territory is not an impartial physical space, but rather a socio-cultural construct imbued with many meanings, values, and power structures.

As Arenas-Monreal et al. (2015) have demonstrated in their research on community health, such participatory maps reveal socio-environmental determinants of health that are not visible from standard technical perspectives. These approaches integrate local experiential knowledge of the landscape with scientific data, providing more comprehensive and contextualized representations that are also more user-friendly.

**Mapping Controversy and Dialogue of Knowledges**

Mapping controversy is an important tool for visualizing the conversations, tensions, and contradictions that characterize any field of knowledge. In line with Latour (2007), in these methodologies, each party maps its perspectives, arguments, and evidence within complex socio-technical conflicts.

These approaches are particularly useful for fostering constructive dialogues in fields characterized by significant epistemological, ontological, or axiological differences. As Barth et al. (2023) note, transdisciplinary learning thrives on such divergences; it uses them as a resource for innovation and transformation.

**Horizons of Sustainability: ethics as the foundation of dialogue**

The interdisciplinary dialogues that make up the ecosystemic logos go beyond epistemology and methodology; building meaningful horizons of sustainability requires an ethics. Recognizing basic interdependence, this dialogical ethics fosters both reciprocity and co-responsibility.

**Planetary Ethics and Interspecies Co-responsibility**

In the face of the modern socio-ecological crisis, the proposal for a planetary ethics is necessary. As Hans Jonas (1984) argues, new ethical concepts are needed because humanity's technological powers require moral principles regarding future generations and non-human life.

Based on the recognition of the fundamental interrelationship of all living systems, this ethics goes beyond abstract individualism or homogenizing collectivism. In the words of Arenas-Monreal et al. (2015), an ecosystemic approach to health reveals how human well-being is inseparable from the well-being of the ecological systems of which it is a part.

**Cognitive justice as the foundation of sustainability**

Cognitive justice, a term coined by Santos (2009), is essential to any authentic sustainability project. It asserts that the epistemological foundations of our contemporary sustainability crisis run deep. One aspect is that established knowledge systems have separated nature and culture rather than integrating them into a single unit; another aspect concerns the value and politics of science.

Engaging in sustainable action means recognizing that there are different forms of knowledge and other modes of existence—that is, cognitive justice. This idea was verified by Castro-Díaz et al. (2022): by integrating a diverse range of knowledge types and perspectives, we arrive at a more comprehensive and locally grounded understanding of complex problems, thereby giving rise to new solutions.

**From Anthropocentrism to Pluralist Biocentrism**

The emphasis on the intrinsic value potentially possessed by all forms of life is a key feature in the shift from anthropocentrism to the ecosystemic perspective. This does not destroy human specificity nor does it overlook differences to arrive at an undifferentiated monism; rather, it emphasizes the plural compendium of beings and ways of being.

Plumwood (2002) adopted a pluralist biocentrism that distanced itself from both hierarchical anthropocentrism and abstract biocentric egalitarianism. This position emphasizes both censorship and difference in interventions regarding forms of life. It is particularly useful for rethinking the relationship between humans and other species in terms of reciprocity and mutual respect.

## Methods

*The research employed qualitative methods involving a hermeneutic-dialectical approach, based on the complex systems paradigm (Morin 2006) and transdisciplinarity. The methodological design took the form of theoretical research of an analytical-interpretive nature that applied a dialogical perspective to facilitate the integration of various fields of knowledge. Its three main theoretical and conceptual frameworks were:*

1. Complexity Theories (Morin, 2006, 2007)
2. Ecology of Knowledge (Santos, 2009)
3. Relational Ontologies (Descola, 2013)

### Data Collection and Interpretation Procedures

Systematic Literature Review A systematic literature review was conducted of primary and secondary sources related to: 1) Transdisciplinary Epistemologies, 2) Complex Systems and Complexity Theories, 3) Knowledge Mapping, 4) Relational Ontologies, and 5) Planetary Ethics. The selection was based on theoretical relevance, recency (publications predominantly from the last 15 years), academic impact, and epistemological diversity.

### Analysis of Epistemological Interfaces

To analyze the interfaces, four basic dialogical axes were adopted: 1) Science and Nature, 2) Technology and Culture, 3) Nature and Culture, and 4) Science and Culture. For each axis, the following points were distinguished: 1) Key concepts and emerging patterns, 2) Epistemological tensions and contradictions, and 3) Points of convergence and possibilities for integration.

### Conceptual Cartography

This is a cartographic methodology designed to visualize and study the subtle interrelationships that exist between various knowledge systems. This mapping was organized into three levels: 1) Mapping the many dimensions and interconnections of modern socio-ecological systems, 2) Complexity Cartographies—Integration into territorial descriptions and understanding of various types of knowledge in participatory cartographies, and 3) Controversy Cartographies.

### Research Methodology and Case Studies

In "The Common Units," the researchers sought to examine the development of a global consciousness. To ensure methodological rigor, the following criteria were applied: 1) Theoretical coherence: Logical articulation between the different conceptual frameworks used, 2) Reflexivity: Explicit acknowledgment of the researcher's position within the field of study, 3) Transparency: Clear explanation of procedures and criteria for analysis, and, 4) Validation through interdisciplinary dialogue: Comparison of perspectives from different disciplines and traditions of thought.

## Results

### Ecosystemic Logos

### Configuration

An analysis of the interdisciplinary dialogues revealed the emergence of an ecologically balanced logos characterized by: 1) Epistemological integration: Overcoming dichotomies inherent in modern Western thought, 2) The interaction of different beings and systems can be called "ontological relationality," 3) The ability to think on many levels and in many dimensions at the same time—multidimensionality, 4) An athletic (processual) dynamism: emphasizing process and change rather than the person and the state.

**Table 1**

*Characteristics of the ecosystemic logos contrasted with Western modern rationality*

| Dimension | Western Modern Rationality | Ecosystemic Logos |
|---|---|---|
| Epistemological | Disciplinary fragmentation | Integrative transdisciplinarity |
| Ontological | Nature–culture dualism | Relational continuity |
| Methodological | Analytical reductionism | Systemic complexity |
| Ethical | Anthropocentrism | Pluralistic biocentrism |
| Temporal | Progressive linearity | Emergent circularity |
| Spatial | Universal homogeneity | Situated diversity |

*Note: The table is based on an own elaboration derived from the analysis of the epistemological characteristics of the ecosystemic logos in contrast with Western modern rationality. Source: Pérez-Villafuerte, R. (2025).*

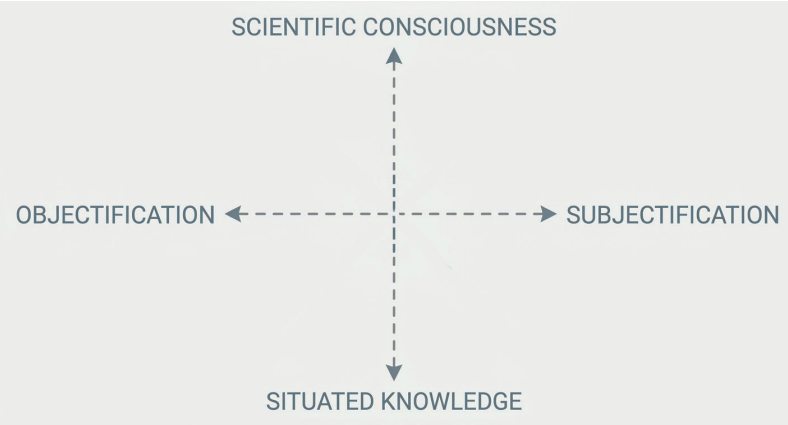
### Emerging Cartographies in Dialogic Axes

#### Science-Nature Axis

Analysis of the dialogue between science and nature revealed the following emerging patterns: 1) Overcoming the objectification of nature: Transition from a conception of nature as a passive object to its recognition as a subject with agency and internal meaning; 2) Scientific awareness of ecology: Development of a reflective science that acknowledges its limitations but assumes responsibility for its effects; and 3) Integration of traditional ecological knowledge: Recognition of the epistemological value of indigenous and local knowledge about ecosystems.

**Figure 1**

*Mapping the Science-Nature Dialogue*




*Note: Author's own work. Conceptual map of emerging dimensions in the Science-Nature dialogue. Source: Pérez-Villafuerte, R. (2025).*

#### Technology-Culture Axis

The analysis of the dialogue between technology and culture revealed: 1) Overcoming technological determinism: Recognition of the mutual interaction between technological systems and cultural configurations, 2) Emergence of the concept of cosmotecnics: Materialization of specific cosmologies in technological development, and 3) Technological pluralism: Identification of multiple possible technological trajectories rooted in different cultural contexts.

**Table 2**

*The content of different contexts in which the technical pluriverse is evident*

| Context | Technological Approach | Distinctive Characteristics |
|---|---|---|
| Modernity | Universal technology | Standardization, scalability, Western orientation, centralized control |
| Communities | Appropriate technologies | Local adaptation, low impact, indigenous knowledge, traditional knowledge |
| Alternative movements | Open technologies | Participatory design, collaboration, accessibility |
| Emerging approaches | Ecotechnologies | Biomimicry, circularity, regeneration |

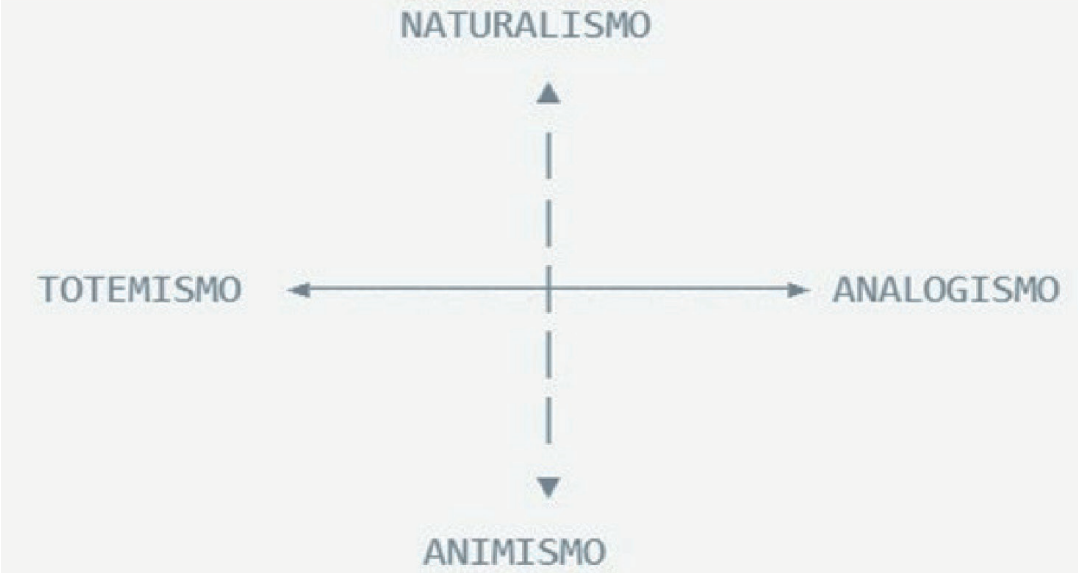
*Note:* Own elaboration based on the analysis of different manifestations of the technical pluriverse in diverse cultural contexts. Source: Pérez-Villafuerte, R. (2025)..

**Nature-Culture Axis**

An analysis of the dialogue between nature and culture revealed: 1) A challenge to the ontological divide: A critique of the conceptual boundary between nature and culture as a specific construct of Western modernity, 2) Multiplied Being: Recognition of the many ways in which humans can form relationships with nature (animism, totemism, naturalism, analogism), and 3) Transition Zones: Creation of spaces where human activities and ecological processes intertwine to create unique patterns.

**Figure 2**

*The mapping of relational ontologies under Descola's analysis*




*Note: Adapted from Descola (2013). Schematic representation of the four fundamental ontologies. Source: Pérez-Villafuerte, R. (2025).*

**Science-Culture Axis**

The analysis of the dialogue between science and culture revealed: 1) Ecology of knowledge: Striking a balance between the recognition of the irreducible plurality of knowledge and its practical application, 2) Intercultural dialogue: Designing and initiating forms of dialogue that can facilitate relationships between different universes of meaning, and, 3) Citizens for Knowledge: An opportunity to create knowledge in a space where experiential wisdom and science blend equally.

**Table 3**

*Intercultural Dialogue of Knowledge*

| Process | Characteristics | Concrete Examples |
|---|---|---|
| Dialogue of knowledge | Horizontal exchange among different forms of knowledge | Incorporation of Indigenous knowledge into ecosystem management |
| Epistemological hybridization | Creation of new forms of knowledge through the integration of diverse traditions | Agroecology as a combination of scientific agronomy and peasant knowledge |
| Co-laboratory | Spaces for collaborative experimentation between scientists and communities | Citizen science projects for environmental monitoring |
| Participatory mapping | Collective construction of territorial representations | Community-based mapping of socio-ecological resources and vulnerabilities |

*Note:* Own elaboration based on the analysis of intercultural translation processes identified in the research. Source: Pérez-Villafuerte, R. (2025).

### The Spectrum of Modern Sustainability Viewed Through Ecosystemic Logic

An integrated examination of the four dialogical axes allows us to identify three main areas for new sustainable development: 1) Planetary Ethos: Based on a recognition that all forms of life are interconnected and interdependent, 2) Cognitive Justice: recognition and celebration of the diversity of forms of knowledge regarding how people live in the world, and, 3) Planetary Biocentrism: The recognition of the intrinsic values of life is one of the modes of pluralistic biocentrism. And it is human-centered.

## Discussion

### Ecosystemic Logos as a Response to the Civilizational Crisis

The results of this research suggest that ecosystemic logos is a coherent epistemological response to the contemporary civilizational crisis as outlined in the introduction. As Morin (2006) noted, "Hyper-specialization obstructs a vision of the whole and the essential," and the resulting fragmented knowledge is incapable of capturing current challenges.

In this context, the ecosystemic logos emerges as an integrated proposal that transcends modern dichotomies and creates new conceptual maps. The relevance of this epistemological proposal is perhaps best illustrated by considering what Santos calls "interknowledge" (2009), that is, that "knowledge worthy of the name always occurs among knowledgeable people." This dialogical perspective is quite different from the monological models of communication that have prevailed in modern science and that, as noted at the outset, have played "an important role in producing our current global socio-ecological crisis."

### Implications for the Science-Nature Relationship

Findings regarding the science-nature axis fundamentally challenge René Descartes's division between person and object, which has dominated Western scientific thought for four centuries. This challenge corresponds to that of the "objectification of nature" raised in the introduction, and to the idea that Western naturalism is merely one ontology among many possible ontologies (Descola 2013).

The emergence of an approach in which nature is regarded as a subject with whom to communicate marks a radical shift in scientific practice. This transformation corresponds to the "scientific consciousness of ecology" described in the introduction—according to Morin (2006), it is not merely a self-indulgent academic

exercise but also the realization that science has limitations and bears responsibility for our existence on Earth for future generations. The approach proposed by Berkes (2018), which integrates traditional ecological knowledge, offers a concrete example of this new dialogic exchange between science and nature. In this sense, from the perspective of Western science, it is the first time in history that we are beginning to understand some important facts about ecosystem dynamics.

**Tensions and Contradictions at the Technology-Culture Interface**

The spirit of inquiry at the technology-culture interface reveals tremendous tensions between thinking that follows technological determinism and the most extreme forms of social constructivism. It is these tensions that point to what Yuk Hui (2019) calls "cosmotekhnika: The process of materializing specific cosmoses in technology," a concept that transcends the one-sided view of technology as either an autonomous entity or a mere social product.

With this dialogical approach working within this perspective, we agree here with Bratton (2016), who argues that new metastructures are emerging around technical infrastructures: "...metastructures that mix and recompose humans with non-humans." The emergence of new metastructures inevitably leads to new forms of governance and control. As a result, this poses new ethical and political challenges for all of us. The emergence of the concept of the "technical pluriverse" (Escobar, 2018) in these findings thus establishes a new horizon for considering technology from the perspective of cultural diversity. This concept critiques the so-called universality and neutrality of traditional technologies and offers opportunities for the development of technical artifacts that adapt to the particular needs and values of each society, as suggested by Lagunas Vázquez (2021) from a transdisciplinary perspective.

**Cognitive Justice: The Foundation of Sustainable Development**

The findings related to the nature-culture axis confirm Descola's (2013) critique of "the great ontological divide": the separation between the human world and the rest of Nature. This emerges as an idiosyncrasy of Western naturalist ontology that is rooted in history. The relational ontologies found in the results also propose concrete alternatives to this chasm, as noted by Castro-Díaz et al. (2022), each of which recognizes that non-human agents help shape the world. From this perspective, life itself shifts the dramatic South, giving us a new meaning: "life is just a long series of connections in which an event (or occurrence) is right in between."

The concept of "hybrid territorialities" identified in the results directly responds to Latour's (2007) idea of "hybrid assemblages"—situations in which human and non-human agents interact together to produce complex sociopolitical ecologies. This concept is particularly important in the Anthropocene era, where human influence reaches virtually every ecosystem on Earth.

**Cognitive Justice: The Foundation of Sustainable Development**

Analysis of the science-culture axis reveals that cognitive justice lies at the heart of genuine sustainability projects. This form of justice, presented by Santos (2009), is a necessary condition for any genuine project of social justice; it challenges the hierarchies of knowledge that have placed Western scientific knowledge at the top and other forms of knowing and being in the world.

But the "ecology of knowledge" highlighted in the results does indeed offer an indispensable general framework for rethinking the relationship between scientific knowledge and cultural diversity. This perspective acknowledges, as stated in the introduction, that "knowledge worthy of the name has always been inter-knowledge." No system of knowledge can be reduced to another without significant loss.

"Intercultural translation" processes emerge as essential tools for facilitating dialogue between different universes of meaning. As Castro-Díaz et al. (2022) argued, translation is an integral part of the work of biologists and anthropologists; these processes take on particular vitality in fields where cultural diversity conflicts with ecology, as in Latin America.

**Emergent Cartographies as Tools for Reorienting Knowledge**

This fundamental epistemological framework represented by the emergent cartographies in the results is a mechanism for going beyond the scientific concept of socio-ecological systems and provides a broader lens through which to interpret the modern world. Moving away from linear ideas of relationships, these cartographies represent a shift toward non-linear thinking: they are networked, like rhizomes, or fractals, and can represent multiple levels of organization along non-linear paths.

As noted by Castro-Diaz et al. (2022), such visual representations illustrate "key control points where a small intervention can produce major systemic changes." Identifying these critical points is crucial in contexts of systemic crisis, where resources are scarce and strategic interventions are required. Participatory mapping, in particular, offers valuable approaches to territorial understanding by integrating diverse types of knowledge. According to the study by Arenas-Monreal et al. (2015) on community health, these participatory mappings.

**Horizons of Sustainability and Planetary Ethics**

Expose socio-environmental determinants invisible to conventional technical analysis. Looking toward the future of sustainability, the horizons mentioned in these results go beyond technical or methodological dimensions and position ethics as a crossroads for interdisciplinary dialogue. The proposal for a planetary ethics grounded in the realization of this fundamental mutual dependence responds to what Hans Jonas (1984) saw as the need for new moral principles in the face of humanity's technical powers.

This ethics of the planet is grounded in the idea that "human well-being is not separate from the well-being of the ecological systems in which it flourishes," as noted by Arenas-Monreal et al. (2015). An ecosystemic perspective on health rules out any artificial separation between humans and other types of life systems.

Valle's normative framework for biocentrism takes on a pluralistic character, in line with Plumwood's (2002) view that rejects both hierarchical anthropocentrism—which is ethically unacceptable—and generalized biocentric egalitarianism, which reduces nature to an abstraction rather than respecting individual creatures. By emphasizing both the commonality and the differences among various forms of life, this perspective offers a particularly fertile ground for ethical reflection on how interspecies relationships should be restructured from a standpoint of pure reciprocity and mutual aid.

**Limitations and Future Challenges**

Although ecological logos holds transformative potential, it also faces clear limitations and challenges. The first is the immense difficulty of putting these epistemological frameworks into practical action within an institutional context that remains dominated by fragmented discursive logics. Today's academic, political, and economic structures tend to resist transdisciplinary approaches that break down established boundaries.

Second, transforming these conceptual frameworks into actual operational methodologies requires extensive experimentation and validation across different settings. The new cartographies promised by the above could indeed be useful tools, but they still need to be tested in the field as mechanisms for constructive dialogue between different forms of knowledge.

Finally, the proposal for an ecosystemic logos faces the challenge of not becoming a new totalizing metanarrative. As Stengers (2018) has urged, we need an "ecology of practices" that recognizes the unique pluralism present in all the different ways of being—without attempting to assimilate them all into a system that would instantly give rise to so many new ways of epistemologically excluding its own Creation.

**Conclusions**

Interdisciplinary dialogues between science, technology, and nature with culture form the boundaries of a radical ecosystemic intelligibility: an emerging way of understanding and inhabiting this world that, for better or worse, transcends those old dichotomies of Western modernity. A new complex rationality, horizons of sustainability waiting to be built against the backdrop of a civilizational crisis.

The ecosystemic logos of these dialogues is not a closed system or a new overarching metanarrative, but rather an open space for conversation among vastly different forms of knowledge and life that have yet to coexist without translating one another. As Isabelle Stengers (2018) proposes, we need an "ecology of practices" that recognizes, without hierarchizing, the incommensurable pluralism of modes of existence.

The emerging cartographies we have explored offer ways to navigate this complexity; tools to make visible connections, tensions, and possibilities at the interfaces across various knowledge systems. These mappings do not merely seek to depict pre-existing landscapes, but to participate in the ongoing creation of new ways of thinking and acting.

Sustainability means building horizons from the ecosystemic logos, which does not conceive of sustainability as a final state to be attained, but rather as a continuous process of conversation, learning, and transformation. As Barth et al. (2023) have demonstrated, transdisciplinary learning is a lever for meaningful transformations, providing a space where different perspectives can engage in productive dialogue with one another.

At a historical moment marked by multiple overlapping crises, the ecosystemic logos offers us not only analytical tools for understanding complexity, but also ethical and political resources for imagining and beginning to realize more just and sustainable worlds. As Morin (2006) notes, we need an "ethics of understanding" that is both realistic and attuned to human needs, mindful of our intrinsic interdependence and the shared responsibility that all living beings on Earth bear for its future.

The radical ecosystemic intelligibility emerging from these interdisciplinary dialogues calls for a new sensibility. What is needed is to keep the doors open even in the face of surprise and uncertainty; to remember the limits of human knowledge without faltering in our quest for understanding. Perhaps this is where our future lies—the most precious thing that ecosystemic logos, as horizons of sustainability, can offer to the people living in this century.

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