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The Postmodernist Politics of Eco-grammar Epistemology

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ABSTRACT: *Our paper investigates the ideological underpinnings of contemporary eco-grammar systems through a Postmodernist lens. Contemporary eco-grammar anthropocentrically functionalises the environment through a Modernist logic. We analyse eco-grammar through Systemic Functional Linguistics (SFL) and other linguistics frameworks, followed by Postmodern critique. Building on this, we introduce the Eco-Grammatical Graph (EGG), a three-dimensional model that spatializes eco-grammar to reveal the eco-ideological implications embedded. We propose that these insights should directly inform high-level decisions in policy and corporate sustainability discourse, through the Brazilian government's Amazon Fund policy and Shell's 'Drive Carbon Neutral' campaign. The EGG's enables the development of AI-driven software that can audit institutional documents before publication, detecting unethical eco-grammatical patterns to prevent eco-ideological harm. When grammar itself enforces ideological violence under the façade of objectivity, grammatical structures must be read as symptoms and language must be reimagined not merely for clarity in communication, but also for ecological and humanity's moral survival.*

KEYWORDS: *Artificial intelligence, ideology, linguistics, postmodernism, sustainability.*

I. Introduction

Ecology, today, finds itself entangled in a profound crisis, not merely of the physical planet, but even of knowledge, perception, and values. The linguistic frameworks through which nature is described have become increasingly saturated with ideologically arbitrary language (Büscher et al., 2012). They instrumentalize ecological actors and thus obscure the multiplicity and agency of ecology itself (Plumwood, 1993). The ecological crisis, then, must be understood not only in terms of metrics, but also in terms of how nature is spoken and written about (Harré et al., 1999). Emerging from critical theory, eco-linguistics interrogates not only what is said about the environment but how it is said (Fill, 2001). While much of the field has focused on discourse-level narratives, a more focused lens reveals that ideological encoding often begins deeper, at the level of grammar (Goatly, 2000). In the context of eco-language, the structures of grammar operate epistemologically to delineate what forms of ecological meaning are conveyable, knowable, and even permissible within eco-discourse (Bourdieu, 1991). It is crucial to note that eco-grammar does not merely describe the world; it has become a medium to reproduce a paradigm that legitimizes control over and extraction from the environment (Dryzek, 2013).

Postmodernism enters this inquiry precisely where there is a questioning of environmentally totalising narratives, rigid meaning structures, and the perceived universality of rational logic (Baudrillard, 1981). Postmodern theory functions as a resistance to (ecologically) functionalizing epistemologies and the Modernist categories they produce (Lyotard, 1984). It insists that language does not merely represent reality but participates in the construction of ontologies, and that these constructions are always political (Derrida, 1978). In this context, Postmodernism leads to the de-functionalisation of grammar, suggesting linguistic systems that do not reduce or instrumentalise the environment, but instead preserve multiplicity, relationality, and ethical engagement (Lyotard, 1984).

Yet the ideological stakes of grammar remain vastly underexamined. If language is the infrastructure of thought, then grammar is its architecture. In eco-discourse, this architecture increasingly resembles a subjugating machine. Grammatical structures determine what can be named and what must remain unspoken. They fix agency in predictable locations, like in governance and in the market, while silencing the animacy of ecosystems themselves. In this manner, the climate crisis is not only worsened by fossil fuels, but also by the fossilization of language. The very grammar used to articulate environmental concern is often complicit in reproducing ecological domination. The violence of ecological collapse does not begin with deforestation or emissions; it begins with the phrases that naturalise those deforestation or emissions. To re-empower nature, we may first have to rewrite sentences.

By attending to these deep structures of environmental language, this paper interrogates the question: How has the current paradigm of the epistemology of eco-grammar systems enacted ideological violence through a Modernist functionalizing logic? It critiques Hallidayan functional grammar and other grammatical theories in eco-grammar through a Postmodernist lens. Based on this analysis, it proposes a framework, the Eco-Grammatical

Graph (EGG), to map the aspects and degrees of grammatical violence encoded in ecological terms. This graph is interpreted through various mathematical tools, including averages, vectors, differentiation, and integration, enabling a precise, measurable, and theoretically rich exploration of how eco-grammar encodes ideological power.

II. Literature Review

M.A.K. Halliday's theory of Systemic Functional Linguistics (SFL) conceptualises grammar as a semiotic system for epistemic construction. For Halliday, language does not passively represent reality: it organises it through grammatical choices that structure the agency of actors, the processes shaping relationships between actors, and the classification of actors into contextual categories (Halliday and Matthiessen, 2014). However, it must be noted that Halliday only briefly addressed the ecological implications of his framework (Halliday, 1990). Alastair Pennycook, for instance, frames language as a site of cultural politics, emphasising how grammatical conventions shape global hierarchies of knowledge and authority (Pennycook, 1994). Similarly, Pierre Bourdieu conceptualises linguistic structures as forms of symbolic power: normalised, internalised, and rarely questioned (Bourdieu, 1991). Crucially, while these insights foreground the ideological dimension of grammar, none explicitly consider ecological contexts. They push eco-linguistic analysis toward recognising grammar as an ideological infrastructure, one that demands not just description but disruption.

Andrew Goatly investigates how grammatical metaphors, such as abstract nouns like "deforestation" or passive constructions that obscure human agency, function ideologically within environmental texts (Goatly, 2000). Yet even Goatly's critical orientation does not interrogate the functionalising logic of grammatical categorisation of the environment. The deeper connection between these grammatical patterns and Modernist ideologies of efficiency, clarity, and utility remains largely untheorised in his work.

Arran Stibbe's concept of "stories we live by" encourages scholars to trace how linguistic patterns reflect and reinforce dominant ideologies such as consumerism, anthropocentrism, or progressivism (Stibbe, 2021). However, most of this scholarship operates primarily at the thematic level of discourse, analysing how metaphors shape worldview, without engaging the deeper skeleton of meaning: grammar itself. Even when Stibbe occasionally refers to grammar, it is usually in relation to lexical patterning or figurative systems, not the deeper, structural, epistemic function of grammar as a system of (especially Modernist) categorisation.

III. Methodology

The first component of our methodology is a critical-theoretical and Postmodernist Deconstructivist analysis of eco-grammar concepts, drawing on Structural Functional Linguistics, and various theories in ideological linguistics. In this approach, grammar is treated not as a neutral representational system but as an epistemic architecture that enforces hierarchical knowledge regimes and encodes power relations (Halliday and Matthiessen, 2014; Bourdieu, 1991). By interrogating the ways in which grammatical structures distribute agency, foreground or background processes, and classify ecological entities, this analysis deconstructs the functionalising logic underlying Modernist eco-grammar systems. The methodology employs textual close reading and structuralist-linguistic critique to reveal how ostensibly objective or neutral eco-discourses reproduce power, marginalise nonhuman agency, and sediment Modernist principles of efficiency, clarity, and utility into language. In doing so, it situates eco-grammar within a Postmodern framework of de-functionalisation, exposing the ideological operations that grammar performs prior to lexical or discursive interventions.

The second component of our methodology operationalises these insights through a graph-theoretical and mathematically formalised model, the Eco-Grammatical Graph (EGG). Here, each grammatical construction is conceptualised as a coordinate point in three-dimensional ideological space, with axes corresponding to temporal durability, value orientation, and function directionality. By plotting constructions in this space, the model visualises ideological load, enabling quantitative comparison of eco-grammatical patterns across texts, genres, or institutional contexts. Analytical tools such as zonation, scalar averaging, algebraic equations, differential and integral calculus are used to calculate trajectories, rates of change, and cumulative ideological density, reflecting both the temporal dynamics and structural intensity of grammatical violence. This formalised approach allows for the operationalisation of eco-linguistic critique, transforming abstract theoretical claims into measurable, visualisable phenomena, suitable for applications in AI-driven linguistic audits, policy analysis, and comparative cross-corpus studies. Through this dual methodology, the paper integrates Postmodern deconstructive critique with quantitative spatial modelling, providing both interpretive depth and empirical tractability.

IV. Grammatical Analysis

Nominalisation

Nominalisation is the representation of human actions, which impact the environment, in the abstract noun form of words (Halliday and Matthiessen, 2014). "Wetland degradation occurred" is a construction that is frequently used in the Global Wetland Outlook to subtly signify ecological harm without posing the destructive

actions as ineluctable and positive ones as overly utopic (Ramsar Convention Secretariat, 2021). In other words, human-driven processes are presented only as a result, rather than as an action we control. This implicitly erases the agents, humans, entirely, transforming ecological violence into a neutral, depersonalised event. Nominalisation is pervasive in environmental discourse; terms such as 'emission reduction', 'deforestation', 'habitat fragmentation', 'resource depletion', and 'ecosystem degradation' also demonstrate this (Stibbe, 2021). Nominalisation fulfills the Modernist drive for classification by translating fluid ecological processes into fixed, discrete categories that appear universally applicable (Scott, 1998; Stibbe, 2021). Once abstracted in this way, these terms circulate primarily through centralised channels such as intergovernmental reports and scientific literature, concentrating definitional authority in institutional hands (Halliday, 1990; Ramsar Convention Secretariat, 2021). This also advances state legibility, as the language becomes optimised for bureaucratic recognition and statistical recording, allowing ecological harm to be rendered into administratively convenient but ethically reductive "events" (Scott, 1998).

Passivisation

Passivisation of sentences permits actions to be grammatically rendered without agents through the use of passive voice (Halliday and Matthiessen, 2014). The passive voice in "Forest-dwellers were displaced" is not merely syntax: it reframes political events as neutral occurrences, detaching them from their human origins. The IPCC Sixth Assessment Report frequently uses passive constructions to discuss habitat decline without naming the actors responsible (IPCC, 2021). "The forest was cleared for agriculture," "The river was diverted," or "The species was lost" appear in environmental reports and development plans (Dryzek, 2013). Passivisation reorients the grammar of environmental harm toward event-based sequencing that suits the Modernist preference for linear, chronologically ordered accounts (Scott, 1998). By framing displacement or destruction as a completed stage in an inevitable progression, the passive voice helps fold ecological violence into development narratives that appear continuous and rational. This also advances a universalising discourse, where local histories of loss are rewritten in a syntactic format that can be replicated across reports, creating an interchangeable template for environmental events (IPCC, 2021; Dryzek, 2013). Centralisation emerges when these passive structures, stripped of local texture, circulate through institutional registers, ensuring that the grammar aligns with the priorities of those producing global assessments rather than those experiencing the harm (Lyotard, 1984).

Modality

Modality, through auxiliary verbs, reflects a speaker's degree of commitment toward the thematic issue (Halliday and Matthiessen 2014). This encompasses both modal verbs (e.g., "must," "may," "should") and modal adjuncts (e.g., "probably," "certainly") (see Figure 1). In UNFCCC decision texts, "Parties should strive to reduce emissions in accordance with their capabilities" (UNFCCC, 2015). These variations are not merely stylistic; they shape the ideological intonation of ecological narratives. Modality, in Postmodern critique, is not a mere gradation of speaker stance: it is a grammar of epistemological authority. These formulations reflect 'the delegation of knowledge through technocratic legitimation', where uncertainty is deployed to defer responsibility and dilute urgency (Lyotard, 1984). Modality functions as a calibration tool, allowing environmental commitments to be expressed in scalable degrees that conform to the Modernist logic of quantifiable obligation (Scott, 1998). By distributing necessity, possibility, or advisability across a controlled linguistic spectrum, modality supports the creation of standardized commitments, phrases like "should strive" or "may consider," that can be harmonised across treaties, reports, and national policies (UNFCCC, 2015). This standardisation facilitates centralisation: authority over what level of action is "necessary" or "appropriate" is consolidated within technocratic bodies, whose interpretations become the definitive benchmarks for compliance (Halliday and Matthiessen, 2014). The universalism embedded in such modal systems smooths over political and ecological differences, applying the same grammatical scale of obligation to radically different contexts, thereby enforcing a singular evaluative framework under the guise of flexibility (Lyotard, 1984). In doing so, modality enables state legibility, not by fixing events in time, but by fixing degrees of responsibility into administratively recognised categories that can be tracked, compared, and negotiated without fundamentally altering underlying power relations.

Hedging

Hedging involves the downtoning of an action, a process or the impact of the same, instead of heightening or 'boosting' (Hyland, 1998) (see Figure 2). This is done through (aside from modals) adverbs, or epistemic markers (e.g., "possibly," "it is suggested that"). Hedging is used to manage political risk by introducing ambiguity into claims of environmental harm. For example, the UNEP Adaptation Gap Report states that "ecosystems may be negatively affected by climate variability," creating epistemological distance from direct attribution to human or institutional actors (UNEP, 2023). Hedging operates as a linguistic containment strategy, aligning with the Modernist commitment to managing uncertainty within controlled semantic boundaries (Lyotard, 1984). By downtoning commitment, hedging converts unpredictable ecological futures into administratively tolerable probabilities (UNEP, 2023). This allows environmental claims to be integrated into standardised reporting

frameworks where risk is classified, graded, and inherent in existing policy cycles (Scott, 1998). The centralisation of interpretive authority follows: it is institutional actors, not affected communities, who determine which degrees of certainty are "acceptable" for publication (Hyland, 1998). Hedging's universalising effect is subtle but potent: it applies the same linguistic threshold of proof to diverse ecological crises, from coral bleaching to industrial pollution, thereby flattening the specificity of harm into a shared, generic register (Baudrillard, 1994). In this way, hedging is a Modernist device for filtering ecological knowledge into a state-legible form that prioritises institutional preservation over ecological urgency.

Aspectual Choice in Verb Tense

Aspectual choice in verb tense identifies how the selection of progressive instead of the perfective verb form functions ideologically (Thompson, 2001). The perfective aspect in "has been emitted" and "was destroyed" enacts temporal distancing. Reports such as the UNEP Emissions Gap Report state "climate damage has already occurred" (UNEP, 2023), rhetorically finalising degradation and shifting the burden from prevention to post-facto adaptation. Aspectual choice shapes not just when an event is situated in time, but how that event is conceptually managed within institutional narratives. The perfective aspect embodies the Modernist preference for closed temporal units that can be recorded, archived, and acted upon as discrete entries in environmental accounts (Thompson, 2001; Scott, 1998). This framing aligns with centralisation, as temporally finalised events are easier to coordinate across policy documents, impact assessments, and statistical models, all of which rely on definitive endpoints to maintain coherence (UNEP, 2023). It also advances a universalising logic, since the same perfective frame can be applied to radically different ecological contexts, erasing ecological temporalities of recovery, persistence, or cyclical harm. By sealing events into grammatically complete forms, aspectual choice contributes to state legibility: ecological damage is transformed into a past occurrence. This enables institutions to shift emphasis from prevention toward post-event adaptation in a way that appears administratively rational but is politically evasive (Derrida, 1976).

Synthetic Personalisation

Synthetic personalisation is how pronouns perform ideologically under the guise of inclusive address (Fairclough, 1992) (see Figure 3). The 2022 UNFCCC synthesis report claims that "we must accelerate our efforts," yet does not clarify whether "we" refers to nations, corporations, or individuals (UNFCCC, 2022). This vague collectivism masks structural asymmetries in accountability. Second-person and first-person plural pronouns create discursive intimacy, constructing an artificial consensus. Synthetic personalisation reflects a Modernist drive toward collectivisation under a single narrative frame (Fairclough, 2001). By constructing an imagined homogenous subject, this grammatical device enables the classification of diverse ecological relationships into one abstract "public" that is presumed to share identical responsibilities and stakes (Scott, 1998). This presumption facilitates the sidelining of specific cultural or local ecological knowledge (Halliday, 1990; Stibbe, 2021). State legibility is also reinforced, as the grammatical "we" produces a statistically coherent subject, the aggregated population, whose behaviours can be measured, compared, and regulated (Scott, 1998). Moreover, by erasing the asymmetries of power, responsibility, and vulnerability between human and institutional actors, synthetic personalisation encodes a universalising Modernist morality that treats climate responsibility as evenly distributed, obscuring the structural drivers of harm (Fairclough, 2001; Stibbe, 2021).

Cohesion

Cohesion is how textual elements are linked to produce semantic continuity using conjunctions (Halliday and Matthiessen 2014). Cohesion can function as a narrative stitching device, connecting otherwise disparate environmental processes into unified storylines (Halliday and Matthiessen, 2014). This is used heavily in the European Green Deal, where conjunctions such as "therefore," "thus," and "however" are used to construct logical flow, even where causal relationships are ideologically strained (European Commission, 2019). Even terms such as "this solution" or "these measures," help institutional discourse present complex mitigation strategies as coherent and already validated. Cohesion here functions less as a neutral connector and more as a discursive apparatus that performs narrative totalisation (Lyotard, 1984). By binding disparate environmental claims into a single syntagmatic flow, cohesion enacts a "simulation of causality," where the grammatical link itself becomes the proof of a relationship that may not exist materially (Baudrillard, 1994). This is a form of ideological suturing, where environmental narratives are made to appear seamless, thereby foreclosing the visibility of systemic ruptures, such as the incompatibility between economic expansion and ecological regeneration. Cohesion is a grammar of closure, not of openness, and thus a vehicle for Modernist teleology: the assumption that environmental processes inevitably progress toward unified, manageable outcomes.

Ideational Balance via Parataxical Clause Structures

Ideational balance via parataxical clause structures offers another avenue for analysis (see Figure 4). This constructs perceived syntactic symmetry masks underlying asymmetry. (van Dijk, 2008; Kress and van Leeuwen,

1996). The European Green Deal reads, "growth must be sustained and emissions must be reduced" equate economic continuity with ecological action, grammatically coordinating disparate objectives (European Commission, 2019). The grammar stabilises ideological tension by suggesting parity between inherently conflicting aims. Parataxis here operates as a flattening device that denies the instability of meaning. By placing economic and ecological imperatives in symmetrical coordination, grammar generates a discursive regime where antagonisms are dissolved into commensurable units (Foucault, 1972). This produces a "false equivalence" by masking the fundamental conflict between economic growth and ecological sustainability, presenting them instead as equally attainable and mutually compatible goals, thereby neutralising critical tension within the discourse (Žižek, 2008). Such parataxis conceals the incommensurability of its objects, economic growth and ecological limits, by installing them in a single, stable syntax. This is Modernist violence: the erasure of difference in service of totalising governance logics. Here, syntax does not merely reflect political will; it actively manufactures the conditions for its own legitimacy by presenting contradiction as equilibrium.

Determiners and Quantifiers

The use of determiners and quantifiers in phrases like "some improvements in air quality," "limited biodiversity impacts," or "considerable conservation success" encode evaluation (Martin and White, 2005). These lexical items routinely appear in global reports, including the WWF Living Planet Report (WWF, 2022), which notes "significant progress" while avoiding metrics that contextualise harm. These determiners modulate effect, softening negative assessments or inflating minor gains. Determiners and quantifiers constitute Modernist micro-technologies of control. They instantiate floating signifiers, which are terms whose boundaries are strategically elastic. This allows institutional actors to oscillate between specificity and vagueness without losing authority over ecology, but in fact only strengthening it (Laclau and Mouffe, 1985). These quantifiers become instruments of strategic opacity: they invite the reader to perceive precision where ambiguity dominates, producing a hyperreality of environmental progress (Baudrillard, 1994). This aligns with Modernist epistemology in which language purports to measure and categorise the nonhuman world comprehensively, even as the metrics evade contestable truths. These quantifiers are part of an ideological economy that trades in the appearance of accountability while displacing substantive ecological critique.

Possessive Genitives

Possessive genitives attribute ownership and jurisdiction over nonhuman entities. "The company's forest assets" or "the nation's biodiversity reserves" grammatically instantiate commodified relationships through grammar (Fairclough, 1992). The Ramsar Convention's Global Wetland Outlook describes "countries' wetland inventories" and "private owners' restoration efforts," assigning nature into possessive frameworks that implicitly legitimize human control (Ramsar Convention Secretariat, 2021). The linguistic act of rendering nonhuman entities as property is a semiotic parallel to their material commodification. Drawing from the concept of territorialisation, eco-grammar here functions to bind living systems into human-centric legal and economic grids, producing what is termed 'accumulation by dispossession' (Deleuze and Guattari's, 1987; Harvey, 2005). In this light, possessive grammar is not simply descriptive but performative: it enacts the very reality it names, foreclosing plural ecological relationships in favour of a single, ownable ontology.

V. Eco-Grammatical Graph (EGG)

Beneath the grammatical patterns previously analysed, three core themes of contemporary eco-grammar systems emerge prominently. First, there is a persistent evasion of responsibility, which we term as Ecovasion, where human agents are erased, obscured, or substituted, creating a syntax of depersonalised environmental harm. Second, there is the creation of a facade: a linguistic illusion that ecological conditions are either stable or being managed, which we term as Ecopretentia. Third, there is the implicit assertion of ownership over nature, or Ecodominion. Each of these themes operates subtly, yet systematically, within eco-grammar, pointing to the presence of a deeper, structural ideological force. And these themes will serve as the foundation for our Eco-Grammatical Graph (EGG).

This force, which underpins these themes, is a functionalising logic: a Modernist epistemological force that demands nature serves a function in benefitting humans. We call this logic the Eco-Logic of Functionalisation (ELF). This logic of eco-grammar operates by reducing ecology into components with instrumental value, linguistically reconfiguring nature as a resource, a system, or a threat to be managed. Within grammar, this manifests not through overt declarations, but through subtle mechanics: who or what becomes a subject, how modality shapes certainty, and whether ecological entities are granted agency or erased. The functionalising logic legitimises hierarchy, anthropocentrism, and extraction. It disciplines thought at the level of grammar, where meaning is pre-structured by assumed utility, permanence, and control. The violence of ecological domination thus begins not only in discourse, but in the architecture of language itself.

To expose and dismantle this logic, we must render its structure legible. This paper therefore proposes a three-dimensional graph, naming it the Eco-Grammatical Graph. Each axis of this graph warrants the construction of one of the three themes: the evasion of responsibility by actors reveals the Directionality of Function, which benefits from the evasion of action; the facade of stability points to the Temporal Durability of Function reflecting the expressed durability of ecological representations over time; and the ownership of nature reveals the Value Orientation of Function, which is the kind of worth assigned to ecological entities.

Deriving the Three Axes

The first axis, Temporal Durability of Function, emerges from the repeated observation that grammar plays a central role in staging ecological harm as either completed or deferred. The system of cohesion, particularly temporal and causal adjuncts, often encodes environmental change through diffused temporal frames, "over decades," "since the 1980s", "has occurred", that obscure immediacy and dilute urgency. This tendency is deepened by modal structures that frame potential futures rather than present imperatives. Verbs such as "may," "might," and "could" position ecological damage within speculative futurity, legitimising institutional delay. Aspectual variation further sharpens this mechanism: perfective forms such as "was destroyed" or "has occurred" stage environmental harm as irreversible and completed, thus displacing political urgency.

The second axis, Value Orientation of Function, is derived from the linguistic encoding of ecological worth and agency. Nominalisation intensifies this by packaging ongoing actions into reified policy objects: terms like "deforestation," "carbon capture," or "climate resilience" convert relational ecologies into discrete tools of governance. Possessive genitives also contribute: phrases like "our biodiversity" or "their conservation efforts" encode ecological entities as property, conferring legitimacy through linguistic ownership. When determiners and quantifiers, "some progress," "significant loss," "this solution", are added, grammar offers the illusion of empirical authority while evading ethical complexity.

The third axis, Directionality of Function, emerges from an analysis of how grammatical forms distribute responsibility, agency, and interpretive authority. Passivisation in "the forest was cleared," "emissions were released," "livelihoods were lost" describes ecological harm without naming the perpetrator. Cohesive devices like "therefore," "however," and "thus" produce the illusion of argumentative progression and legitimacy, even in the absence of explicit causality. These patterns are extended through synthetic personalisation. Parataxis flattens contradiction through clause coordination: "emissions must fall and economies must grow" presents a false equilibrium between competing imperatives.

While each axis isolates a distinct grammatical modality, their interaction is neither additive nor independent; they operate as a mutually conditioning system. Directionality of Function is constrained by Value Orientation: grammatical agency flows more readily toward entities already framed as possessing worth, whether instrumental or intrinsic. Value Orientation is temporally stabilised by the Temporal Durability of Function: ownership claims and valuations are legitimised by the temporal framing that renders them enduring, cyclical, or permanent. In this sense, the Eco-Grammatical Graph does not merely chart variables; it models a dynamic feedback loop in which grammar recursively reinforces the very ideological hierarchies it encodes, aligning with Postmodern accounts of discourse as a self-perpetuating system of power (Foucault, 1980; Fairclough, 2010).

Axes' Thresholds

The first axis, Temporal Durability of Function, captures how grammar stages ecological processes across time. Each threshold reflects a different temporal framing. 'Futurised' projects environmental change into potential futures, highlighting ethical anticipation but leaving immediate responsibility diffuse. 'Post-temporal' presents ecological harm as concluded or archived, fostering reflection but detaching accountability from the present. 'Irreversible' signals permanent, unrecoverable damage, emphasizing urgency. 'Systemic' denotes deeply embedded structural changes that resist short-term intervention, highlighting complex causality. 'Sustained' represents ongoing but non-permanent change, where resilience remains possible. 'Intermittent' describes recurring or irregular processes, foregrounding variability and reversibility. Finally, 'Ephemeral' frames events as momentary or isolated, emphasizing contingency and rapid recovery potential while risking the erasure of systemic causes.

The second axis, Value Orientation of Function, reflects how ecological entities are linguistically assigned worth and agency. 'Intersubjective' describes nature as possessing active agency and affect, while 'Autonomous' recognises ecological actors as independent of human intervention. 'Relational' frames nature's role in anthropocentric or mediated terms, acknowledging interaction without full autonomy. 'Instrumental' presents ecological entities strictly through their use-value. 'Abstracted' transforms nature into bureaucratic, metric, or policy objects, stripping relational meaning. 'Obsolescent' denotes discursive erosion of ecological value, and 'Erased' represents complete omission of environmental entities from discourse, effectively removing them from grammatical and conceptual recognition.

The third axis, Directionality of Function, identifies how grammatical forms allocate responsibility and agency. 'Self-Referential' occurs when agents act primarily upon themselves. 'Relational-Ethical' distributes

agency in a morally informed relational manner. 'Distributed Dialogic' acknowledges multiple actors, reflecting a multipolar understanding of responsibility. 'Neutralised' deflects agency through passivisation or vague nominalisation. 'Delegated-Upward' assigns responsibility to institutions or higher authorities. 'Legitimated' uses modality or formalism to construct consensus without explicit accountability. 'Obfuscated' conceals agency entirely, creating the illusion of action while eliminating identifiable actors.

The Three-Scalar Average Metric (TSAM)

A construction such as "ecosystems have been degraded over time" registers as epistemically strong on the Z-axis (functional directionality), due to its explicit recognition of environmental harm. However, it ranks low on both the X-axis (temporality) and Y-axis (value orientation), scoring just 1 and 2 respectively, because of its perfective aspect and its institutionally distanced, impersonal tone. The result is a coordinate such as V(1,2,5), yielding a grammatical profile that is ethically ambiguous. The clause signals discursive awareness of ecological damage. However, it grammatically reifies that damage as temporally complete and removes identifiable human actors from the event structure. This diminishes the scope for accountability or action.

To resolve the challenge of uneven axis performance and enable comparative scalar interpretation, we introduce the Three-Scalar Average Metric (TSAM). This metric computes the arithmetic mean of a construction's coordinate values across the three axes of the Eco-Grammatical Graph, temporality (X), value orientation (Y), and functional directionality (Z), thus producing a single index of ideological density. Formally, we define it as:

TSAM is

$$= \frac{X_G + Y_G + Z_G}{3}$$

This metric allows comparative ethical analysis across constructions and genres. It quantifies how fully a clause inhabits ideologically charged positions. A higher TSAM score signals a greater density of ideological features in urgency, relational ethics, or instrumental violence. Grammatical meaning cannot be determined by any single axis. It emerges from the interplay of temporality, value, and power. The multidimensional ethical gradient, rather than any single scalar point, defines ideological load.

Critical Nodes as Ideological Extremities

When a single structure sits at the terminal point of all three axes, we designate it a 'Critical Node'. In our finite, and quantified model, Critical Nodes are represented by (7, 0, 0) or the Chronocliff, (0, 7, 0) or the Worthfall, and (0, 0, 7) or the Thronecore. These are grammatical formations that reach minimal permanence, total instrumentalisation, and complete ideological service to institutional power. Bureaucratic constructions like "emission reduction targets" or "sustainability indicators" demonstrate this phenomenon. The notion of the "inhuman" (Lyotard, 1991) becomes relevant here: grammar at these points automates ideological behaviour without recourse to human agency. Such linguistic forms represent ethical collapse zones.

Zonation as Ideological Field

The Terravex Zone lies in the region of the Eco-Grammatical Graph (EGG) defined by permanence, institutional servitude, and epistemic exhaustion. This will correspond to all of the following regions combined together in our model: $4.67 < x < 7$, $4.67 < y < 7$, $4.67 < z < 7$. With respect to current paradigms, this zone is densely populated by nominalised, passive, and de-agented structures found in international policy discourse, environmental finance literature, and ESG reports. Phrases such as "biodiversity offsetting frameworks," "climate adaptation targets," or "resource depletion thresholds" typify this grammar. Here, temporality is flattened into bureaucratic finality, power flows upward toward institutional management, and epistemic value is extracted and exhausted. Grammatical metaphor dominates, abstracting violent or relational processes into objectified outputs. This zone is not ideologically neutral. It is the syntactic armature of ecological governance under Modernism. The zone's linguistic density gives it discursive dominance, but its ethical profile is one of maximal detachment. It represents the peak of grammar's complicity with technocratic ideology: 'the performative regime of legitimation' (Lyotard, 1984).

The Sylvaria Zone occupies the opposite pole: constructions marked by ephemerality, self- or relation-oriented function, and intrinsic value. This will correspond to all of the following dimensions in our model: $0 < x < 2.33$, $0 < y < 2.33$, $0 < z < 2.33$. Here, temporality is ongoing or transitory, often marked by progressive aspects or circumstantial complexity. Power flows reflexively rather than hierarchically, and epistemic stance affirms the being of the nonhuman without instrumental pretext. This is the linguistic register of Indigenous environmental storytelling, poetic ecologies, and certain feminist environmental writing. Sentences like "The river remembers"

or "The mountain is watching" are not grammatical deviations but ideological resistances: they assert spiritual or affective agency where bureaucratic language silences it. This zone enacts "relational ontology" through grammar (Plumwood, 1993). Here, grammar becomes speculative, intimate, and intersubjective.

The Mediavos Zone sits at the scalar midpoints: constructions that are temporally sustained, epistemically mixed, and directionally ambiguous. This will correspond to all of the following dimensions in our model: $2.33 < x < 4.67$, $2.33 < y < 4.67$, $2.33 < z < 4.67$. It is the domain of academic journal articles, science journalism, and public policy documents that attempt to balance neutrality and critique. These texts often use agentive clauses with cautious modality (e.g. "governments might consider reducing emissions") and retain a discursive tension between systemic critique and technical reporting. The grammar here is neither aggressively extractive nor affirmatively relational. Instead, it performs a kind of ideological hedging, leaving space for interpretation but rarely challenging discursive authority. This is the "ideological middle ground" of language, where neutrality becomes a form of power in itself (Fairclough, 1992).

While the Eco-Grammatical Graph identifies zones based on what is grammatically and ideologically present in ecological discourse, it also reveals the structured absence of particular constructions. These exclusions form what may be termed the 'Spectral Zones': regions of the graph that, while theoretically valid, remain largely unpopulated. The spectrality of these zones is not accidental: it reflects the disciplinary architecture of Modernism, which sanctions only those linguistic forms that preserve managerial, calculable, and human-centred worldviews. To visualise absence is itself a political act.

Eco-Distance of Grammatical Expression (EDGE)

The distance formula in our model of three-dimensional space would calculate the straight-line distance between these points, regardless of any path taken to move between them. We call this the Eco-Distance of Grammatical Expression (EDGE). Each grammatical construction can be plotted as a point whose coordinates correspond to its measured values on the three ideological axes: temporal durability, value orientation, and function directionality. The distance formula will calculate the degree of ideological difference between two constructions that may not be connected by any editorial progression. By inputting their respective coordinates into the formula, we obtain a single value representing how far apart they are in ideological space. A small distance would indicate that the two constructions share similar ideological positioning across all three dimensions, whereas a large distance would signal that they are fundamentally different in temporal framing, ethical value assignment, and power-serving directionality. This provides nuance to the zonation-based analysis, offering a degree-type understanding of eco-grammatical constructions from a chosen reference point. This allows the model to compare unrelated linguistic artefacts with mathematical precision, enabling empirical analysis of ideological convergence or divergence even when there is no direct textual relationship between them.

Eco-Linear Equation of Construction (ELEC)

In three-dimensional analytic geometry, the equation of a straight line passing through two points can be expressed in the standard symmetric form. We call this the Eco-Linear Equation of Construction (ELEC) for any two eco-grammar constructions.

$$\frac{x - x_1}{x_2 - x_1} = \frac{y - y_1}{y_2 - y_1} = \frac{z - z_1}{z_2 - z_1}$$

This representation captures the precise spatial relationship between any two given points, where each coordinate changes proportionally along the line. If a third point lies on the same line, it will satisfy this equation exactly; if not, its deviation indicates curvature or an altered trajectory. The line equation in this form establishes the fundamental baseline for tracking positional continuity in three dimensions, allowing any intermediate point on the path to be located or predicted by the following form.

$$x = x_1 + t(x_2 - x_1), \quad y = y_1 + t(y_2 - y_1), \quad z = z_1 + t(z_2 - z_1)$$

Within the Eco-Grammatical Graph, the evolution of an idea's grammatical construction can be represented as a point defined by its coordinates on the three ideological axes: temporal durability, value orientation, and function directionality. By taking two points, we determine the straight line representing the ideological trajectory between them. The third point checks whether the movement from start to finish followed a consistent direction in ideological space. This transforms editorial progression into a geometric object that can be tested mathematically for directional consistency. In practical linguistic analysis, this means that even subtle grammatical edits, such as altering the agent in a sentence, can be plotted as part of a measurable ideological path.

The line equation thus exposes the underlying intentionality in institutional editing, revealing ideological design behind what might otherwise be dismissed as routine linguistic variation.

Slopewave as Ideological Shift

In the Eco-Grammatical Graph, the independent variable is always time, and the dependent variables are the clause's coordinates on the three ideological axes. Each revision date produces a timestamped coordinate. So, the derivatives tell us how quickly a certain clause is moving through ideological space at that moment, called the Slopewave. By analysing these rates, we can identify whether a clause's position is changing steadily, abruptly, or barely at all between revisions.

$$\frac{dx}{dt}, \quad \frac{dy}{dt}, \quad \frac{dz}{dt}.$$

This approach allows institutional discourse analysis to detect moments of acceleration in ideological change. A sudden spike in the derivative might signal a rapid shift in value orientation: such as a clause being reworded to downplay environmental responsibility. By quantifying the rate of change, we can move beyond vague descriptions of "rapid transformation" to precise evidence showing when and how the ideological speed increased, potentially revealing the moments of highest editorial intervention.

Graviflare as Ideological Weight

A triple integral extends the idea of integration into three dimensions, calculating the total accumulation of a quantity over a volume in three-dimensional space and is termed as Graviflare. The triple integral sums all the values of (x, y, z) within the defined volume in the graph. This produces a single number representing the total quantity, whether mass, charge, or any measurable property, across that space. In the Eco-Grammatical Graph, the integral will represent the ideological "density" of a grammatical construction at any coordinate in the three-axis space. The trajectory of revisions traces a path that occupies a certain volume in this space over time. Integrating over this volume gives the total ideological load the clause has carried through its revisions, not just its starting and ending points.

$$\iiint_V f(x, y, z)\, dx\, dy\, dz$$

This reveals not only where a clause ended up ideologically. It also shows the scale and intensity of transformations, which is critical for identifying discursive processes that conceal ideological labour through iterative, incremental edits.

VI. Artificial Intelligence And Applications

The EGG's mathematical precision allows for the creation of Artificial Intelligence-driven analytical software that can apply the model to institutional documents prior to publication. The software would identify and flag linguistic constructions that match thresholds associated with unethical eco-grammar patterns. These include temporal deferral, anthropocentric valuation, and agentive obfuscation. Because the EGG operates at a syntactic and structural level, this process goes beyond keyword searches. It enables detection based on grammatical function and narrative framing. Integrating this system into editorial workflows would allow organisations to revise problematic constructions before public release, reducing the likelihood of embedding harmful ideological patterns in policy, corporate communication, or legal text. In this capacity, the AI application of the EGG functions as a pre-emptive compliance tool, ensuring that language adheres to ecologically responsible representational standards.

The Eco-Grammatical Graph enables the systematic tracing of how policy language sanitises ecological harm: not through omission, but through structural manipulation. Crucially, it foregrounds how institutional registers discipline expression: not only by excluding certain lexicons, but by favouring nominalisations and future-conditionals that defer action. In treaty language, where semantics are negotiated across political lines, the graph serves as an audit tool to reveal compromise syntax: those moments where grammar itself performs diplomacy by neutralising conflict. Rather than merely 'reading' policy, the model allows us to track its epistemological drift, grammatically, politically, and ethically.

Brazil's Amazon Fund

The political suspension and mismanagement of the Amazon Fund marked a critical moment in Brazil's environmental governance, where the failure to act decisively compounded ecological harm on a global scale. Had the Eco-Grammatical Graph been applied during the drafting, revision, and public communication of policy surrounding the Fund, the outcomes may have been radically different. The difference would have been climatic, not merely linguistic. The model would have immediately revealed a discursive drift: away from ecological urgency and toward bureaucratic vagueness, where key terms like "reassessment" and "realignment of priorities" functioned to obscure both temporal stakes and institutional accountability (Spring, 2019; Watson, 2020). Through its Function Directionality axis, the EGG could have exposed how grammatical choices consistently served political self-preservation rather than environmental action. Policy actors and international funders could have used the model to demand revisions. These revisions would grammatically reassert agentive responsibility, ecological specificity, and temporally durable commitments (Phillips, 2019). By foregrounding such patterns before they sedimented into official texts, the Graph could have redirected the trajectory of governance. This would move it toward actionable clarity and away from rhetorical delay. Moreover, the Value Orientation axis would have highlighted the semantic reduction of forests to sites of "economic opportunity" or "funding leverage," thereby allowing public and legal pressure to reassert intrinsic ecological valuation in the language of policy itself (Watts, 2021). In this way, the EGG is not merely retrospective; it offers pre-emptive grammar-based intervention. If deployed in this case, it might have helped forestall the loss of millions of hectares of rainforest, not by changing the data, but by forcing a change in the structure of how the crisis was linguistically framed, negotiated, and postponed.

Within corporate sustainability discourse, the Eco-Grammatical Graph functions as a critical diagnostic tool for exposing greenwashing at the level of syntax. ESG reports, mission statements, and brand campaigns often appear environmentally responsible while relying on linguistic mechanisms that abstract, euphemise, or shift agency. This is a form of ideological ventriloquism, in which nature speaks only through what it can yield to capital. By applying the graph to corporate texts, one may conduct linguistic sustainability audits that detect patterns of obfuscation, misrepresentation, and anthropocentric bias. Beyond critique, it offers a framework for reform, guiding organisations in recalibrating their communicative practices to align with genuine ecological accountability: grammatically, discursively, and ideologically.

Shell's 'Drive Carbon Neutral'

Shell's 'Drive Carbon Neutral' campaign illustrates how corporate climate discourse can use grammar to simulate environmental responsibility while materially delaying emissions reductions. If the Eco-Grammatical Graph had been applied to Shell's campaign language prior to its release, it could have flagged critical discursive patterns that enabled corporate greenwashing. The campaign repeatedly framed offsetting in nominalised and agentless terms, e.g., 'carbon emissions are offset' and 'neutrality is achieved.' These linguistic constructions, when plotted on the Function Directionality axis, would have revealed a trajectory toward corporate image management rather than ecological transparency (Harvey, 2020). These constructions structurally sever Shell's agency from the material effects of its operations, allowing the company to occupy a position of environmental virtue without enacting substantial emissions cuts. The Temporal Durability axis would have registered the mismatch between the permanent ecological effects of fossil fuel extraction and the transitory, unverifiable claims of offsetting, many of which involved short-term forestry credits later found to be inflated or ineffective (Carrington, 2021). If the Graph had been deployed during campaign development, regulatory agencies or internal sustainability teams might have intervened earlier, demanding grammatical constructions that foreground direct accountability and ecological specificity. Instead of simulating neutrality, Shell may have been compelled to communicate actual reduction plans, accelerating meaningful decarbonisation. The EGG thus offers more than critique: it enables a proactive mechanism for preventing linguistic obfuscation from enabling environmental delay.

The Eco-Grammatical Graph is not merely a conceptual tool but a diagnostic framework with aesthetic and activist utility. It may be applied to corpus linguistics, discourse audits, environmental storytelling, and activist publishing. Artists and writers can use the model to reconstitute narrative voice, uncover silences in eco-narratives, and experiment with syntax as resistance. Its spatial metrics offer both critique and creative potential in the reimagining of ecological representation. More broadly, the graph invites future extensions across linguistic traditions and cultural grammars. Its framework can be applied to Indigenous syntax systems, ecocritical translation practices, and non-alphabetic or non-Western languages. This opens space for rethinking not just the content but the structural ethics of language, shifting eco-grammar beyond Modernist norms toward pluralist, situated, and relational grammars.

VII. Limitations Of The Model

The Eco-Grammatical Graph condenses complex ideological properties of grammar into three measurable axes: temporal durability, value orientation, and function directionality. This reduction is necessary for mathematical modelling. However, it inevitably leaves out other possible dimensions, such as emotional

resonance, audience reception, or intertextual framing, that may also carry ideological significance. As a result, the model captures only a subset of the full ideological complexity present in language.

Placing a grammatical construction at a specific point on the graph requires interpretive judgement. Although this process can be guided by systematic criteria, it cannot escape bias. Different analysts, especially from different disciplinary or cultural backgrounds, may assign slightly different coordinates to the same construction. This means that while the model can reveal patterns, the precision of those patterns depends on the consistency and transparency of the coordinate assignment process.

VIII. Figures

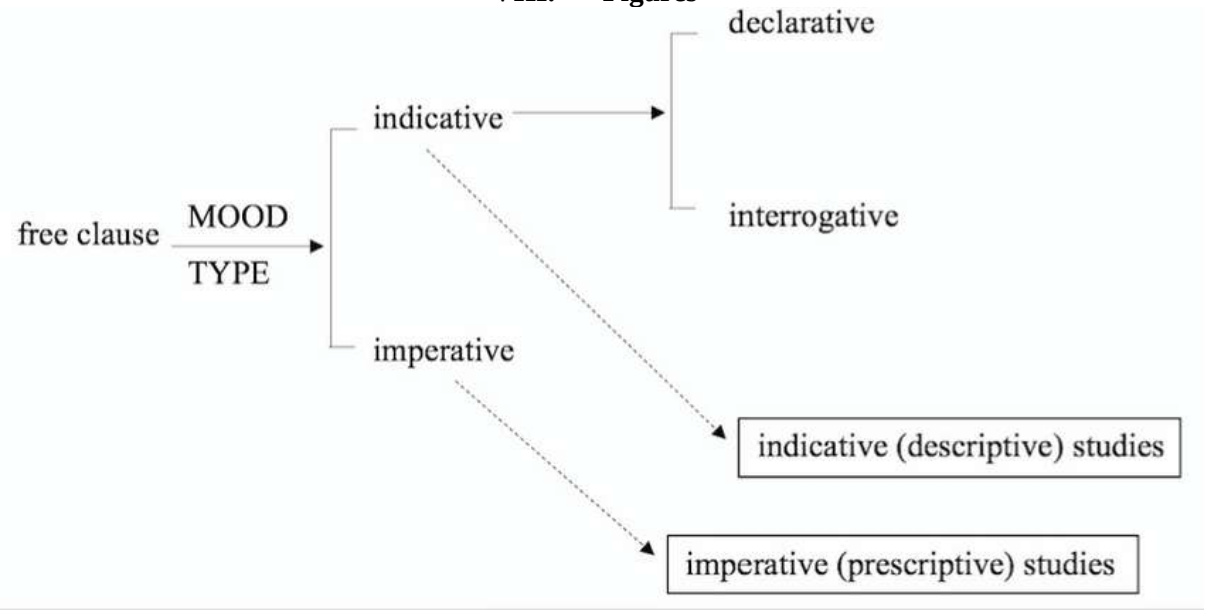

Figure 1: Halliday's 2001 distinctions in 'modality'.

Classification	Example
Hedges	
modal verbs	*could, might, would*
epistemic adjectives, adverbs and nouns	*perhaps, likely, interpretation*
lexical verbs	*seem, assume, suggest*
Boosters	
modal verbs	*must, will*
epistemic adjectives, adverbs and nouns	*obvious, always, argument*
lexical verbs	*demonstrate, show, find*

Figure 2: Hyland's categorisation of 'hedge' modals and 'booster' modals.

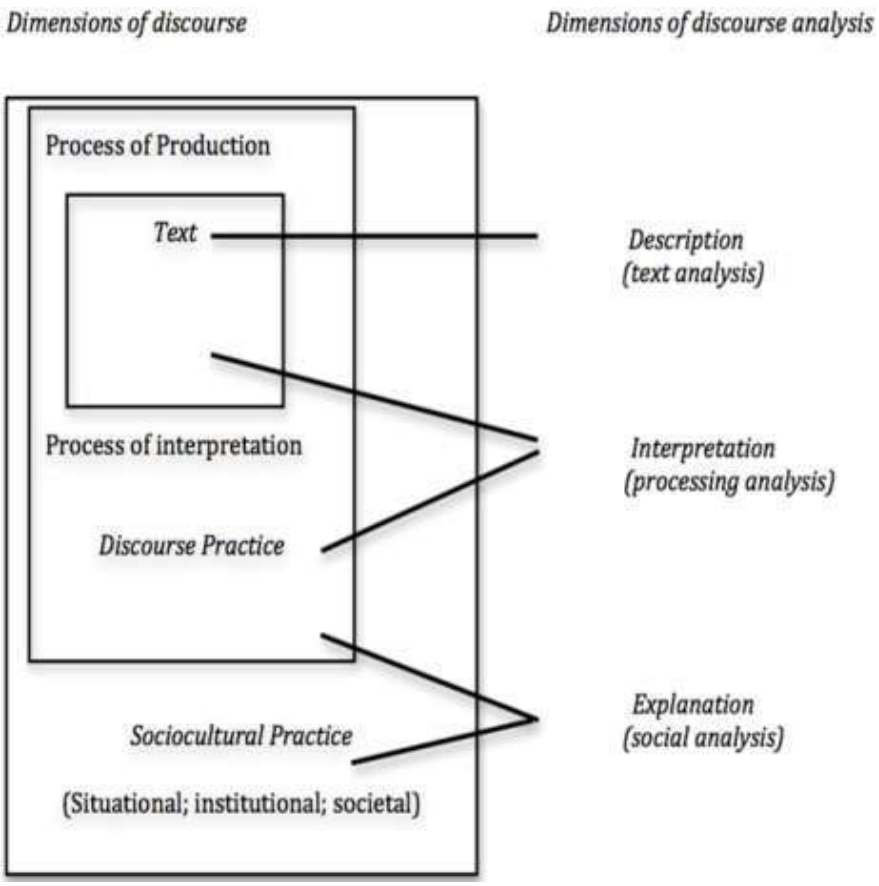

Figure 3: The landscape of synthetic personalisation in ideological discourse, according to Fairclough, 1992).

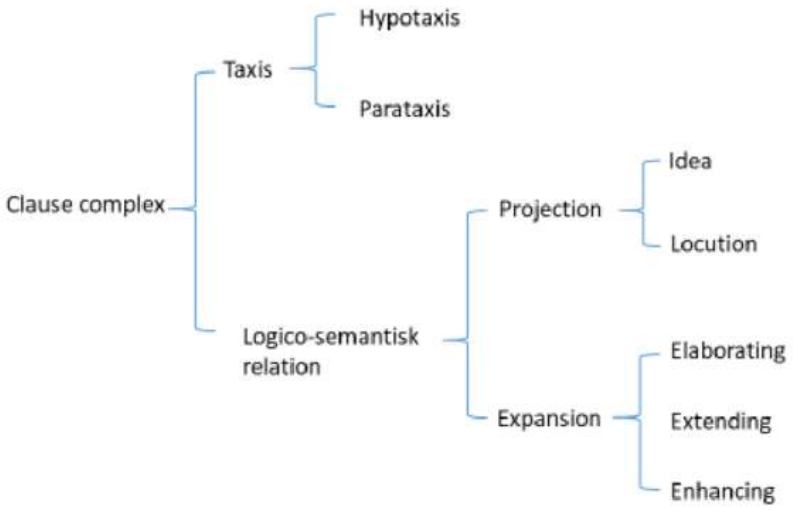

Figure 4: Leeuwens' schematic representation of the semantic macrostructure of a text, 1996.

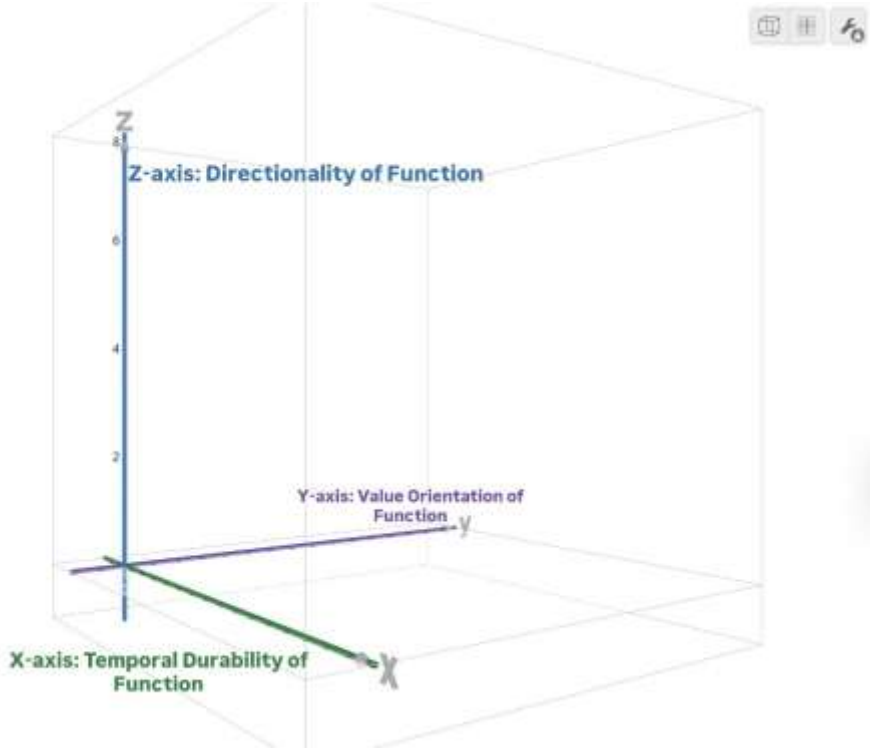

Figure 5: Basic structure of the three-dimensional Eco-Grammatical Graph we have constructed.

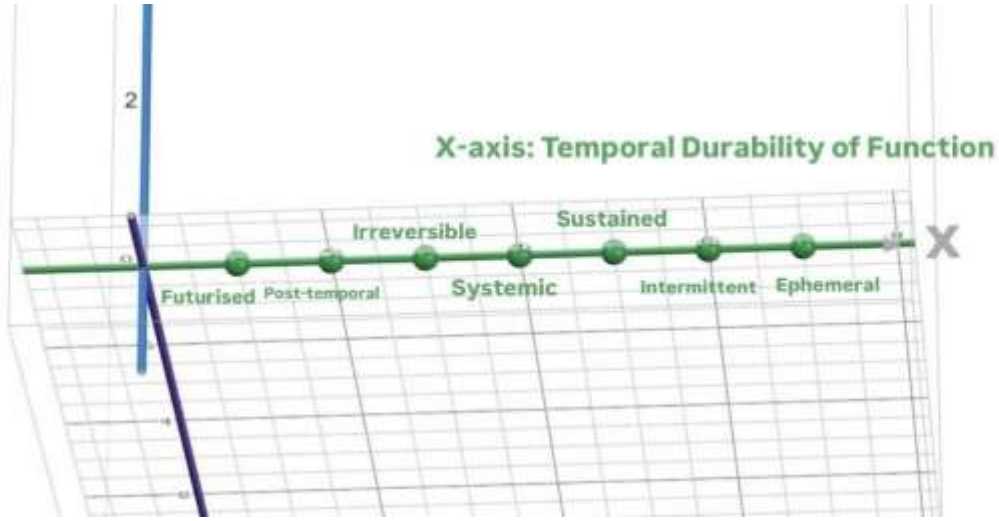

Figure 6: Positioning the temporal thresholds on the X-axis: Temporal Durability of Function.

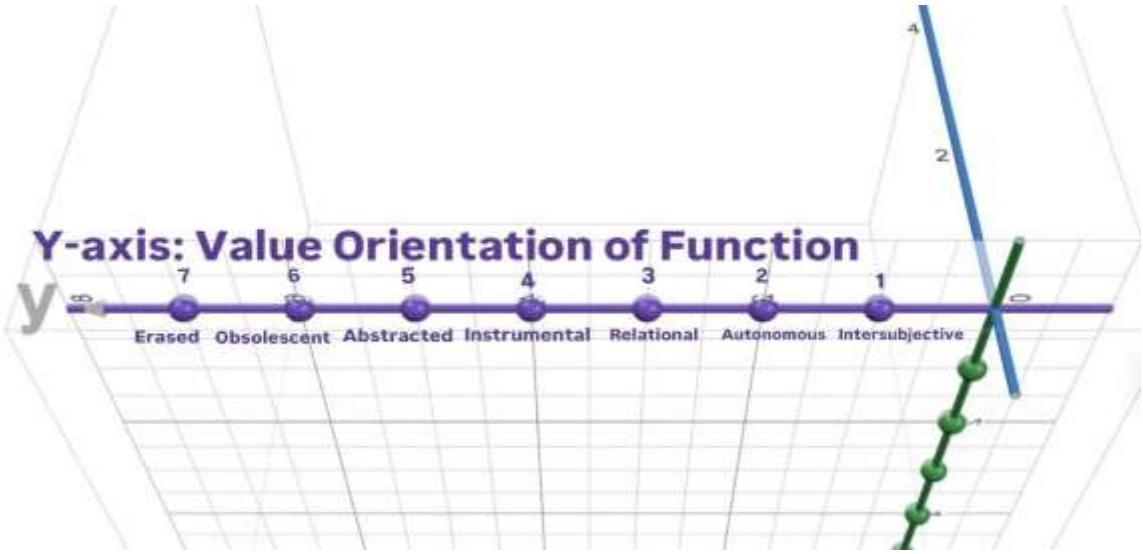

Figure 7: Positioning the orientation thresholds on the Y-axis: Value Orientation of Function.

Figure 8: Positioning the directional thresholds on the Z-axis: Directionality of Function.

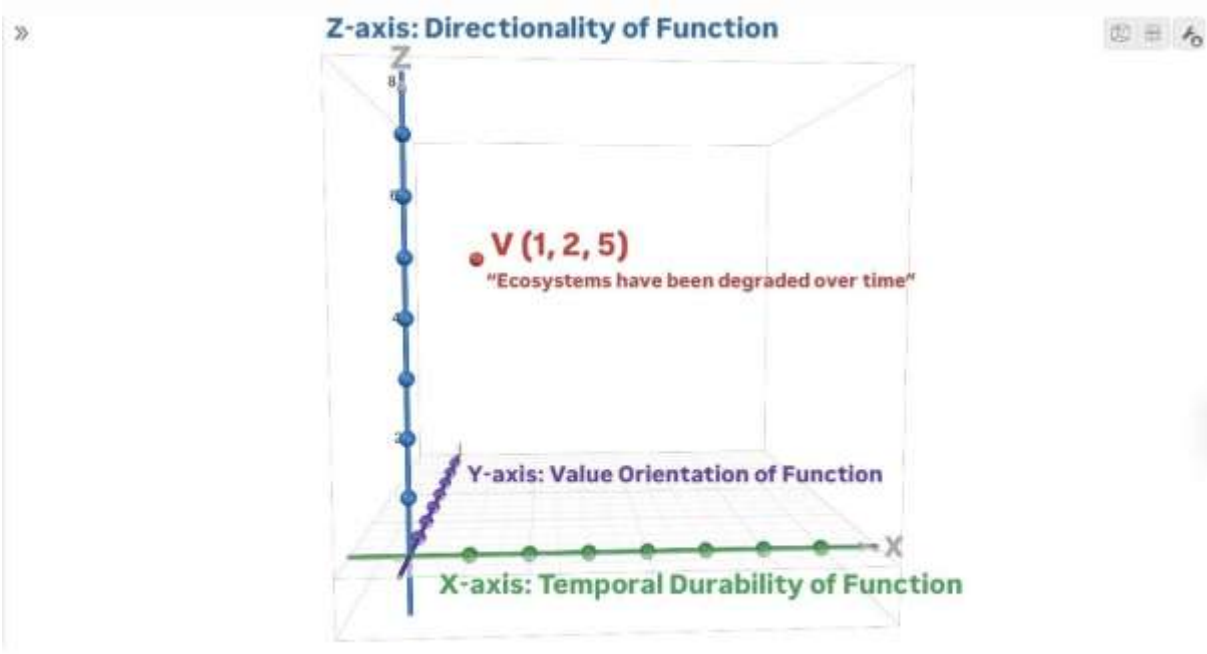

Figure 9: Point V (1, 2, 5) plotted in the EGG.

IX. Conclusion

Our inquiry arose from a recognition that environmental language is not ideologically neutral but often performs discursive work that aligns with anthropocentric and extractionist worldviews. It sought to reconfigure grammar as not merely descriptive, but as structurally ideological, capable of encoding and enacting entire political imaginations. An innovation of this paper, the Eco-Grammatical Graph, responds to this need. The graph enables new ways of thinking about the political function of language.

But this paper's most urgent lesson is philosophical: that grammar is not innocent. It constructs worlds by delimiting which worlds are speakable, endurable, and salvageable. We have seen that grammar erases agency, diffuses harm, or suspends time. It does not merely miscommunicate, it even mis-represents reality. To chart these distortions is not an academic indulgence, but a moral imperative. For in every nominalisation that erases a subject, in every passive clause that veils responsibility, we find not just a linguistic flaw but an ideological wound. The graph shows that grammatical structures do not simply reflect the world: they participate in building one. And in the case of contemporary eco-grammar systems, they often build one that cannot sustain life. Put simply: language has been sustaining unsustainable ideologies.

Glossary

[1]. Ecovasion: the core theme in the epistemology of contemporary eco-grammar systems of evasion of human responsibility in ecological destruction.

[2]. Ecopretentia: the core theme in the epistemology of contemporary eco-grammar systems of pretending that human ecological management has been successful.

[3]. Ecodominion: the core theme in the epistemology of contemporary eco-grammar systems of humans being superior to and being in ownership of ecology.

[4]. Eco-Grammatical Graph (EGG): a three-dimensional, trizonal, graphical model that quantifies qualitative judgements for the purpose of the representation of eco-grammatic constructions.

[5]. Eco-Logic of Functionalisation (ELF): the key Modernist epistemological force that demands ecology serves a function in benefitting humans.

[6]. Temporal Durability of Function: the first axis of the Eco-Grammatical Graph (EGG), which represents the endurance of ecological value, ranging from 'Futurised' to 'Ephemeral.'

[7]. Value Orientation of Function: the second axis of the Eco-Grammatical Graph (EGG), which represents the form of ecological value, ranging from 'Intersubjective' to 'Erased.'

[8]. Directionality of Function: the third axis of the Eco-Grammatical Graph (EGG), which represents the identification of the entities that are benefitted by ecological value, ranging from 'Self-Referential' to 'Obfuscated.'

[9]. Three-Scalar Average Metric (TSAM): a metric that computes the arithmetic mean of a construction's coordinate values across the three axes of the Eco-Grammatical Graph, temporality (X), value orientation (Y), and functional directionality (Z), thus producing a single index of ideological density.
[10]. Chronocliff: the quantitative status of grammatical formations that reach minimal permanence, which is (7, 0, 0).
[11]. Worthfall: the quantitative status of grammatical formations that reach total instrumentalisation, which is (0, 7, 0).
[12]. Thronecore: the quantitative status of grammatical formations that reach complete ideological service to institutional power (0, 0, 7).
[13]. The Terravex Zone: the region of the Eco-Grammatical Graph (EGG) that is defined by permanence, institutional servitude, and the terrarium being epistemically vexed and exhausted, precisely $4.67 < x < 7$, $4.67 < y < 7$, $4.67 < z < 7$.
[14]. The Sylvaria Zone: the region of the Eco-Grammatical Graph (EGG) that is defined by ephemerality, self- or relation-orientation of natural realms' value, and intrinsic value, precisely $0 < x < 2.33$, $0 < y < 2.33$, $0 < z < 2.33$.
[15]. The Mediavos Zone: the region of the Eco-Grammatical Graph (EGG) that is defined by temporal sustainability, epistemic mixture, and the state of being directionally in the middle, precisely $2.33 < x < 4.67$, $2.33 < y < 4.67$, $2.33 < z < 4.67$.
[16]. Eco-Distance of Grammatical Expression (EDGE): a metric that computes the straight-line distance between any two eco-grammatical constructions in the Eco-Grammatical Graph (EGG).
[17]. Eco-Linear Equation of Construction (ELEC): a representation of the linear ideological trajectory between two eco-grammatical constructions within the Eco-Grammatical Graph (EGG).
[18]. Slopewave: a representation of the slope of ideological movement using differential calculus within the Eco-Grammatical Graph (EGG).
[19]. Graviflare: a representation of the ideological weight or 'gravity' of a grammatical construction using integral calculus within the Eco-Grammatical Graph (EGG).

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