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# THE ECOSYSTEM REPRESENTATION PROBLEM

LEGITIMACY, STANDING, AND ECOLOGICAL  
DEMOCRACY IN ENVIRONMENTAL AI

What if the environmental crisis persists not only because we destroy ecosystems, but because our institutions still do not know how to represent them?

This paper examines the missing political form between ecological concern and ecological consequence. It argues that until ecosystems gain standing as represented principals, they will remain vulnerable to being acknowledged, consulted, and ultimately overruled.

# ABSTRACT

Environmental AI is rapidly increasing the visibility, legibility, and narratability of ecosystems in public life. Rivers can now be modeled, voiced, visualized, and represented with unprecedented fidelity. Yet visibility is not the same as standing, and representation is not the same as constraint. Modern institutions remain structurally organized around human persons, human interests, and human time horizons; ecosystems, even when culturally recognized, still tend to appear as managed objects, stakeholder concerns, or externalities rather than as principals with claims that bind. As a result, the central unresolved problem in Environmental AI is not intelligence alone, nor even authority in the abstract, but legitimate representation.

This paper argues that ecological governance becomes legitimate only when ecosystems are institutionally represented as principals with procedural standing, rather than symbolically recognized while remaining structurally optional. Building on the distinction between symbolic and structural environmental AI, it develops a theory of ecological representation grounded in standing, fiduciary duty, evidentiary plurality, public reason, reviewability, and contestability. It argues that stakeholder frameworks are insufficient because stakeholders can be heard without altering what institutions are permitted to sacrifice, whereas represented principals reorder duty and justification. The paper then outlines the conditions under which ecosystems can enter governance without collapsing into romantic proxy politics, technocratic substitution, or symbolic theater. The result is a framework for ecological democracy in which more-than-human representation is not an ethical add-on to existing institutions, but part of the legitimacy architecture by which decisions are made, contested, and constrained.

# EXECUTIVE SUMMARY

Environmental AI is making ecosystems more visible, more legible, and more interactive than ever before. Rivers can be modeled, forests can be voiced, landscapes can be rendered through dashboards, digital twins, and avatars, and ecological signals can now enter public and institutional life with unprecedented clarity. But this development, important as it is, does not yet solve the core political problem. Visibility is not standing. Voice is not yet representation. And representation is not the same as institutional consequence.

This paper argues that the central unresolved problem in Environmental AI is not intelligence alone, nor even authority in the abstract, but **legitimate representation**. Modern governance systems can absorb ecological data, ecological warnings, and ecological symbolism without changing the deeper terms under which decisions become binding. Ecosystems may be recognized, modeled, and even heard, while remaining structurally optional. They are still too often treated as managed objects, stakeholder concerns, or moral symbols rather than as principals with claims that institutions must answer to.

The paper develops a theory of ecological representation grounded in a simple but consequential shift: ecosystems must move from being treated as **stakeholders by proxy** to being treated as **represented principals**. Stakeholders can be consulted without altering what governance is permitted to sacrifice. Principals change the burden of justification. Once ecosystems are represented as principals, ecological integrity is no longer merely one factor among many; it becomes something owed protection, something that can trigger duty, review, contestation, and public explanation.

From this core move, the paper identifies the minimum conditions of legitimate ecosystem representation: **standing, duty, review, contestability, evidentiary plurality, public reason, and continuity across time**. These conditions form the threshold between symbolic inclusion and institutionally serious representation. The paper argues that legitimacy does not arise from discovering a pure spokesperson for nature, nor from giving ecosystems a compelling symbolic voice. It arises procedurally, through a representational regime that makes ecological claims structured, reviewable, challengeable, and difficult to neutralize silently.

The paper also addresses the practical question of proxy: **who speaks for nature?** Its answer is that no single guardian, expert, community, or AI system can legitimately occupy that role alone. Ecological representation must instead be distributed across bounded institutional functions. Guardians preserve fiduciary continuity. Scientific roles discipline claims through ecological evidence. Anthropological and place-based roles preserve situated meaning and

lived relation. Advocative and legal roles translate ecological integrity into duty, standing, and justificatory burden. Legitimacy emerges not from purity of proxy, but from accountable mediation.

On this basis, the paper advances a broader political claim: ecological representation implies a new form of **ecological democracy**. This is not simply a greener version of stakeholder participation. It is a reorganization of legitimacy around **biospheric constraint**. Democratic institutions remain democratic, but they can no longer treat ecological integrity as an external policy variable. Some ecological conditions must be recognized as part of the legitimacy architecture of governance itself. A polity cannot plausibly claim self-government while systematically degrading the living systems on which that self-government depends.

The paper also clarifies what it does not claim. It does not claim that ecosystems can be represented without distortion, that conflict disappears, that AI is inherently legitimate, or that one institutional blueprint fits all contexts. It explicitly confronts the risks of technocracy, romanticism, proxy capture, anti-democratic overreach, and institutional complexity. Its argument is narrower and more serious: without a theory of legitimate ecosystem representation, Environmental AI remains vulnerable to symbolism, Rights of Nature remains vulnerable to procedural weakness, and democracy remains vulnerable to governing as though biospheric dependence were politically optional.

The final implication is direct. Environmental AI should not be judged primarily by fluency, realism, or analytical sophistication. It should be judged by whether it helps ecosystems acquire real standing within governance. That means representation must come before automation. AI becomes meaningful only when embedded in a legitimate representational order—one that allocates duty, supports review, preserves contestability, carries ecological memory across time, and makes ecological claims harder to ignore without consequence.

In that sense, the unresolved bottleneck is no longer whether nature can be made visible. *It is whether ecosystems can become institutionally present in ways that alter what governance is allowed to do.*

After *From Symbolism to Authority*, I initially thought the next step would be mainly about implementation: how to move from symbolic Environmental AI toward systems that carry more procedural weight in governance. But while developing the conceptual foundation and architectural direction of the pilot project *Een stem voor de Schelde*, it became clear that another question had to be answered first. Before asking how an ecosystem voice can become authoritative, one must ask a prior and more difficult question: under what conditions is that voice actually representative? That realization became the origin of this paper.

In the early phases of the Scheldt pilot, the challenge still appeared in familiar terms. How do you create an ecosystem presence that is meaningful, persuasive, and grounded? How do you translate the complexity of a river-estuary system into a form that people can engage with? How do you move beyond dashboards and reports toward something more relational, more intelligible, and more publicly resonant? These remain important questions. But as the project evolved, they proved insufficient. A compelling avatar, a strong ecological model, or a well-designed interface did not yet resolve the issue that started to matter most: *who or what is being represented here, and on what basis?*

At one point, my mind drifted somewhere more personal. I began to wonder how my daughter might soon react to the Scheldt avatar. What would she see in it? Would it feel like a meaningful presence, something understandable, something believable? That thought sharpened the problem for me in a way that was both simple and demanding. It was no longer only about whether the system was conceptually sound or technically advanced. It became about what it would take to design something that was not only legible, but also credible — something that could make the river present in a way that felt both accessible and defensible.

That question changed the project.

The moment an ecosystem avatar is imagined not merely as a communication tool, but as part of a governance process, the stakes shift. It is no longer enough for the system to be eloquent, informative, or technically sophisticated. It must also be procedurally defensible. What distinguishes a river voice from a projection? What gives such a system legitimacy rather than symbolic appeal alone? How should ecological evidence, lived experience, institutional memory, legal reasoning, and fiduciary responsibility relate to one another inside a system that claims to speak on behalf of an ecosystem? These questions became unavoidable in the Scheldt process.

One of the clearest insights to emerge was that a river cannot be represented legitimately through one voice alone. Not because voice is unimportant, but because no single mode of voice can carry the burden of representation by itself. The Scheldt is not only a biophysical system. It is also a lived landscape, a legal and administrative object, a site of memory, industry, care, extraction, and conflict. Any serious attempt to represent it had to reflect that plurality rather than smoothing it away.

This was one of the reasons the tri-bench architecture stopped feeling like a conceptual preference and began to feel necessary. The ENVAI's Scientist, Anthropologist, and Advocate sub-agents were no longer just useful roles. They became differentiated representational functions. The Scientist was needed because ecological thresholds and system conditions demand disciplined evidence. The Anthropologist was needed because ecosystems are always socially encountered, culturally situated, and historically lived. The Advocate was needed because neither evidence nor meaning alone determines what is owed, what is permissible, or what should trigger duty, review, or dissent. What became visible through the pilot was that legitimacy depends on keeping these forms of authority distinct while forcing them into accountable relation with one another. That insight sits behind this paper.

*The Ecosystem Representation Problem* was written because the pilot exposed a conceptual gap that could no longer be ignored. *From Symbolism to Authority* argued that ecosystems need more than visibility, and that AI matters politically only when it enters the authorization layer of governance with procedural force. But the Scheldt process showed that something was still missing between symbolism and authority: **legitimacy**. Before an ecosystem can be authoritative, it must first be represented in a way that is institutionally defensible. Before ecological intelligence can become consequential, the questions of standing, principalhood, duty, review, and contestability have to be confronted directly.

The pilot also made another realization difficult to avoid: many design choices are, in fact, constitutional choices in disguised form. Decisions about what counts as evidence, how claims are weighted, how disagreement is preserved, which knowledge enters the system, and when outputs become reviewable are not merely technical matters. They encode assumptions about representation. They shape whether an ecosystem is treated as a symbol, a stakeholder concern, an expert object, or a represented principal.

That recognition is part of why this paper sits where it does in the series.

*From Symbolism to Authority* made the case that the field must move from expressive systems to binding systems, from persuasion infrastructure to accountability infrastructure. This paper begins one step earlier than implementation and asks what kind of representation must exist if ecosystems are to appear in governance as more than eloquent objects of concern. Its argument is that legitimate ecological representation requires more than voice. It requires standing, duty, review, contestability, public reason, and continuity across time. It requires moving ecosystems from stakeholder language into principalhood. And it requires accepting that the question "who speaks for nature?" cannot be solved by finding a perfect proxy, only by designing a representational regime that makes mediation accountable.

The Scheldt pilot did not resolve that problem once and for all. But it did something more important. It forced the problem into the open.

I sometimes find myself wondering what Ysa will think of all this once she begins to understand what we are trying to do. Perhaps that is one of the clearest tests of all: whether what we are building can one day be understood not only as imaginative or innovative, but as a serious attempt to make the living world matter in how we decide.

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Over the last few years, Environmental AI has begun to move from the margins of experimentation toward the machinery of governance. Systems that can ingest heterogeneous ecological data, model complex dynamics, generate scenario outputs, and render ecosystems newly legible are increasingly being directed toward water governance, biodiversity monitoring, climate adaptation, land-use planning, and environmental risk. In parallel, a more public-facing layer of Environmental AI has emerged: dashboards, digital twins, ecosystem avatars, interactive interfaces, and conversational systems that make rivers, forests, coastlines, and habitats appear more visible, intelligible, and morally proximate. This shift matters. Modern societies rarely protect what they cannot perceive, and symbolic systems can help repair that perceptual deficit by making ecological reality narratable and present. Yet a central problem remains unresolved. Legibility is not the same as standing, and representation is not the same as constraint.

*From Symbolism to Authority* argued that this distinction is constitutional, not aesthetic. Symbolic systems can widen attention, build cultural legitimacy, and improve representation without changing obligation. Structural systems, by contrast, operate at the level of procedure: they make ecological thresholds, warnings, and fiduciary constraints institutionally consequential by linking them to mandates, review processes, standards, and public justification. The difference between the two is the difference between being invited into governance as a participant and entering governance as a constraint. In the former mode, Environmental AI informs. In the latter, it helps bind.

That earlier argument clarified a great deal, but it also exposed the next unresolved question. If environmental intelligence is to become authoritative, what exactly is it that becomes authoritative? Or more precisely: what would it mean for an ecosystem to be represented legitimately within governance? The problem is not solved by giving nature a voice, a face, a model, or even a legal designation in the abstract. Institutions can host ecological information, ecological narratives, and even ecological symbolism without altering the terms under which decisions become binding. They can make a river visible while keeping it politically optional. They can recognize ecological stakes while continuing to treat them as negotiable against short-term human priorities. In that sense, the unresolved bottleneck is no longer visibility. It is representation.

This is the deeper implication of the prior paper's claim that modern governance suffers from a structural mismatch between ecological reality and institutional architecture. Ecological

systems operate through thresholds, feedback loops, cumulative effects, and non-linear breakdowns. Their stability is not negotiated. Governance systems, by contrast, are usually organized around human time horizons, fragmented jurisdictions, discretionary balancing, and institutions architected around human persons, human interests, and human standing. In that architecture, ecosystems do not normally appear as principals with claims that bind. They appear as objects of management, assets, risks, externalities, or stakeholder concerns by proxy. Even where Rights of Nature frameworks exist, they often remain procedurally peripheral: symbolic recognition without strong enforcement pathways, or standing without durable institutional integration.

That is why the central unresolved problem in Environmental AI is not intelligence alone, nor even authority in the abstract, but legitimate representation. Modern institutions already know how to process data, expertise, risk, and consultation. They know how to convene stakeholders, manage participation, and absorb dissent into procedure. What they do not yet know how to do—at least not in a stable and generalizable way—is treat ecosystems as represented principals whose integrity must be publicly answered to. A stakeholder can be heard without changing what institutions are permitted to sacrifice. A represented principal changes the burden of justification. Once that shift occurs, ecological harm is no longer only something to weigh among competing interests; it becomes something owed, breached, defended, or unjustifiably imposed. The movement required is therefore not from ignorance to awareness, but from optional consideration to standing.

This paper argues that ecological governance becomes legitimate only when ecosystems are institutionally represented as principals with procedural standing, rather than symbolically recognized while remaining structurally optional. That claim does not depend on finding a perfect spokesperson for nature, nor on imagining that AI itself can solve the philosophical problem of proxy. The question “who speaks for nature?” is real, but it cannot be resolved by locating a singular authentic voice. It must be addressed procedurally: through standing, fiduciary duty, evidentiary plurality, reviewability, contestability, public reason, and institutional forms capable of carrying ecological claims across time and conflict. Legitimacy, in other words, arises not from purity of proxy, but from the design of a representational regime.

This is where Environmental AI becomes relevant again, but now under stricter conditions. AI does not generate legitimacy by itself. It becomes politically meaningful when it functions as part of an institutional architecture that carries ecological constraints into public reason, preserves continuity across political cycles, exposes deviations, and makes ecological claims harder to ignore without explanation. Without such a representational order around it,

Environmental AI risks becoming precisely what the previous paper warned against: a sophisticated form of symbolic governance, increasing the resolution of ecological concern while leaving the authorization structure intact. The question is therefore no longer whether ecosystems can be modeled, visualized, or voiced. The question is whether they can become institutionally present in ways that alter what governance is allowed to do.

The pages that follow pursue that argument in several steps. First, they clarify the representation problem itself by distinguishing voice, visibility, advocacy, standing, and principalhood. Second, they show why modern institutions fail at ecological representation even when ecological knowledge is abundant. Third, they argue that stakeholder logic is insufficient for more-than-human legitimacy because stakeholders express affected interests while principals anchor duties. From there, the paper develops a framework for legitimate ecosystem representation grounded in procedural standing, fiduciary obligation, evidentiary plurality, contestability, and public justification. It then situates that framework within a broader account of ecological democracy: not as a moral supplement to existing governance, but as a reorganization of legitimacy around biospheric constraint. The aim is not to claim that the representation problem disappears once named. The aim is to make clear that without a theory of legitimate ecological representation, Environmental AI will remain caught between symbolism and technocracy—highly articulate, increasingly intelligent, and still structurally unable to make the living world count where power is exercised.

## 2. The Representation Problem

The language of "giving nature a voice" has become increasingly common across environmental thought, design practice, public art, legal innovation, and emerging AI systems. Rivers are spoken through, forests are narrated, ecosystems are visualized, and new interfaces invite human publics into forms of dialogue with more-than-human worlds. This shift is significant. Modern societies struggle to care for what they cannot perceive, and symbolic systems can widen the moral and imaginative field by making ecological systems more proximate, relational, and legible. In that sense, voice matters. It can create recognition where there was neglect, and presence where there was abstraction. But voice, by itself, does not yet solve the political problem. A system may be heard without being binding. An ecosystem may be represented without becoming institutionally consequential. The first distinction this paper therefore insists upon is simple but decisive: voice is not yet standing.

This distinction follows directly from the argument of *From Symbolism to Authority*. There, symbolic environmental AI was defined as operating primarily at the level of representation: making ecological conditions visible, emotionally resonant, and publicly present. Structural environmental AI, by contrast, was defined by its entry into the procedural architecture of governance, where outputs cannot be ignored without justification and ecological thresholds become part of reviewable decision pathways. The earlier paper framed the danger precisely: symbolic systems become a failure mode when voice is mistaken for standing, and representation is mistaken for constraint.

*To understand why that distinction matters, several terms must be separated that are too often collapsed into one another.*

**Visibility** means that an ecosystem becomes perceptible within public discourse or institutional attention. **Voice** means that an ecosystem is made speakable or expressible through narrative, data, modeling, interface, guardianship, or representation. **Consultation** means that ecological perspectives can be heard within a process. **Advocacy** means that someone argues on behalf of ecological interests. **Standing**, however, means something stronger: it means that claims enter the procedural structure of decision-making in ways that trigger obligation, review, justification, and contestability. Standing is not simply being present in the conversation. It is being present in the architecture that determines what must be answered to.

This is why a river avatar, however compelling, does not by itself possess standing. A dashboard may make ecological degradation unmistakable. A digital twin may render scenarios

at extraordinary resolution. An ecosystem voice interface may widen empathy and improve public understanding. These are meaningful gains. But if the institution remains free to ignore the output, delay response, reinterpret the signal as optional, or absorb the system into reporting and consultation without altering its underlying discretion, then no standing has yet been achieved. The ecosystem has become legible, perhaps even memorable, but it has not become a principal that governance must answer to. It has entered the room as a guest, not as a constraint.

The difference matters because institutions are perfectly capable of absorbing visibility without accepting obligation. Indeed, *From Symbolism to Authority* argued that this is one of the defining features of symbolic governance: it allows ecological concern to be expressed at higher resolution while preserving the same underlying structure of discretion. Dashboards, models, risk maps, consultation processes, and participatory interfaces can all become proof that an institution is modern, informed, and responsive, while leaving untouched the more consequential question of what it is actually required to do. Symbolic governance is stable precisely because it provides legitimacy signals without demanding structural change. It creates the appearance of responsiveness while protecting the ability to continue harmful trajectories under the cover of procedural activity.

Seen in this light, the ecosystem representation problem is not primarily about expressiveness. It is about institutional translation. How does an ecological claim move from the level of attention to the level of obligation? How does an ecosystem move from being something people may listen to, into something public power must justify itself against? Those questions cannot be answered by aesthetics, storytelling, or interface design alone. They belong to the domain of standing. A represented entity has standing when its condition can trigger pause, review, redesign, mitigation, explanation, challenge, or escalation through procedures that others are not free to bypass casually. Standing therefore names a shift in the status of ecological claims: from optional inputs within decision-making to constraints that structure what counts as a legitimate decision in the first place.

This is also the point at which the difference between stakeholder logic and principal logic begins to emerge. A stakeholder can be consulted. A stakeholder can be given voice. A stakeholder can even be central to a process without altering the deeper ontology of governance. Stakeholders express affected interests, but institutions remain free to weigh those interests against others according to existing political and economic priorities. A principal changes the structure of duty. When an ecosystem is treated as a represented principal, ecological integrity is no longer merely a factor to be considered alongside competing

preferences; it becomes something owed protection within the justificatory structure of governance. The shift is subtle in language and radical in consequence. Under stakeholder logic, harm is regrettable but negotiable. Under principal logic, harm may become a breach of duty.

At this point, the obvious objection arises: who could ever truly speak for nature? The force of the objection is real. Ecosystems do not speak in the way humans speak. Their interests are not reducible to human preferences, and any representational mechanism risks distortion, projection, capture, or romantic invention. But this objection should not be misunderstood. It does not show that representation is impossible. It shows that representation cannot rest on the fantasy of a perfectly authentic proxy. No single guardian, model, scientist, community representative, or AI system can resolve the question once and for all. That is precisely why legitimacy must be procedural. The answer to the ecosystem representation problem is not a pure spokesperson. It is a representational regime designed to make ecological claims accountable, plural, reviewable, contestable, and difficult to neutralize silently.

This is one of the most important carry-forwards from the previous paper. *From Symbolism to Authority* explicitly stated that representing ecosystems procedurally is not the same as resolving all ethical debates about who speaks for nature, how plural values are reconciled, or how cultural worldviews differ. Ecosystem representation will remain contested, and it should remain contested. But the paper's sharper claim was that without institutional mechanisms for representation—mechanisms that translate ecological integrity into obligations that can be challenged and audited—those debates remain culturally important but politically ineffective. Legitimacy, it argued, requires both cultural recognition and procedural standing. Symbolic systems can advance recognition; structural systems provide standing. That formulation is the hinge on which the present paper turns.

The ecosystem representation problem can therefore be stated precisely. The issue is not whether ecosystems can be modeled, narrated, or even publicly "heard." The issue is whether they can become institutionally present as entities whose condition reorganizes justification. This means that voice must be connected to procedures that encode duty, preserve continuity across time, expose deviations, and create pathways of review and escalation. Without that connection, representation remains expressive but non-binding. It may still matter culturally. It may even matter strategically. But it does not yet alter the constitutional status of ecological claims inside governance. It produces presence without standing.

This is why the paper insists that the central unresolved problem is not "how to make nature speak," but **how to make ecological claims count where power is exercised**. That requires more than empathy and more than information. It requires a change in the conditions under which decisions become legitimate. A decision-making system has crossed from symbolic inclusion into representational standing when ecological claims are no longer treated as optional insight, but as claims that structure compliance, trigger procedural obligations, and impose legitimacy costs on deviation. In that sense, standing is not a mood of recognition; it is a position within institutional architecture.

The rest of this paper proceeds from that threshold. If voice is not yet standing, then the next question is why modern institutions remain so structurally resistant to granting standing to ecosystems even when ecological knowledge is abundant and ecological crisis is widely acknowledged. That is the deeper institutional problem to which we now turn.

### 3. The Anthropocentric Grammar of Governance

If voice is not yet standing, the next question is unavoidable: why is standing so difficult to secure, even under conditions of escalating ecological breakdown, abundant scientific knowledge, and growing public awareness? The answer cannot simply be ignorance. Modern institutions are not blind in any absolute sense. They measure, model, disclose, monitor, consult, and increasingly visualize environmental harm in sophisticated ways. The problem is deeper. It lies in the grammar through which governance recognizes claims as binding in the first place. The failure of ecological representation is therefore not only moral or political. It is architectural. Modern institutions are built to answer to certain kinds of claim, from certain kinds of subject, on certain kinds of timeline. Ecosystems do not fit easily into that grammar.

This is what *From Symbolism to Authority* identified as the governance gap in constitutional form. The obstacle is not merely a lack of data, nor a failure of technological capability, nor even an absence of stated concern. It is a structural mismatch between ecological reality and the institutional architecture of modern governance. Ecological systems operate through thresholds, feedback loops, cumulative pressures, and non-linear breakdowns. Their stability is not negotiated. Governance systems, by contrast, are typically organized around discretionary choice, fragmented competences, short political horizons, and institutions designed around human standing. The resulting mismatch is predictable: ecological degradation is treated as something to be managed, mitigated, reported, or balanced, rather than as a condition that determines what governance may permissibly do.

At the center of this mismatch is what might be called **the anthropocentric grammar of governance**. Liberal-democratic institutions are historically architected around human persons, human rights, human interests, and human forms of accountability. This is not a trivial observation. It means that the default units of governance are persons, constituencies, firms, sectors, jurisdictions, and stakeholders—entities that can claim, negotiate, sue, vote, bargain, and be recognized within human political language. Nature, even when rhetorically valued, is usually rendered within this system as object rather than subject: a resource, an amenity, an asset class, a risk factor, a managed habitat, or at best a stakeholder concern represented by others. In such an architecture, ecosystems do not readily appear as principals with standing. They appear as things governed about, not entities governance must answer to.

This anthropocentric grammar shapes not only who counts, but **what counts as a legitimate claim**. A budget shortfall is legible. A court order is legible. A protest is legible. A market shock is legible. An election is legible. These events trigger procedural attention because they fit the

operative code of institutions: they are attributable, immediate, socially recognized, and connected to formal consequences. Ecological degradation often arrives differently. It appears as background drift, cumulative erosion, probabilistic risk, threshold proximity, habitat simplification, declining resilience, or intergenerational loss. These are real forms of harm, but they do not naturally trigger institutional response in systems whose accountability mechanisms are optimized for visible events and human grievance. The result is a structural bias toward reacting late, after ecological processes have crossed from warning into damage.

Time is therefore a central component of the anthropocentric grammar. Ecological systems unfold across durations that frequently exceed electoral cycles, fiscal calendars, procurement windows, and investment horizons. Wetland degradation, salinization, biodiversity collapse, soil exhaustion, and basin destabilization often accumulate gradually before becoming suddenly obvious. Yet political accountability is rarely organized around slow violence. It is triggered more easily by scandal, price spikes, visible disaster, or immediate distributive conflict. This does not mean democratic systems are inherently incapable of long-term reasoning. It means they are structurally incentivized to discount long-term ecological constraint when short-term political rewards are more visible and enforceable. Under such conditions, responsibility to the future becomes an ethical aspiration rather than a durable institutional duty.

Jurisdiction is the second major fault line. Ecosystems do not conform to administrative boundaries. Rivers cross municipalities, provinces, and states. Species ranges exceed zoning maps. Air pollution, nutrient loads, sediment dynamics, and hydrological pressures move through systems that governance divides into departments, mandates, licenses, and competences. The mismatch is not simply inconvenient; it is constitutive. Even when institutions share environmental goals, responsibility is diluted across overlapping authorities, partial mandates, and conflicting legal scopes. No single actor is fully responsible for the ecological whole, while each can point to procedural limits on what it can do alone. In this fragmented landscape, representation fails because there is no coherent institutional location in which ecological integrity appears as a principal claim rather than a coordination problem. The result is often what the previous paper called coordination theater: meetings, frameworks, stakeholder rounds, and strategic alignments that signal intent without producing binding consequence.

The third feature of the anthropocentric grammar is discretionary balancing. Modern governance tends to treat competing claims as commensurable interests to be negotiated: jobs, housing, mobility, growth, affordability, energy security, and environmental quality are

placed into a field of trade-off where institutions seek politically survivable equilibria. But ecosystems are not merely one interest among others. Their integrity often conditions the possibility of the whole field within which bargaining occurs. When ecological limits are translated into stakeholder language, they become easier to absorb into negotiation. They can be weighed, deferred, compensated, or rhetorically acknowledged without altering the underlying structure of discretion. This is one reason stakeholderism so often fails as a basis for ecological legitimacy: it fits too neatly within the anthropocentric grammar of balancing among human claims. A stakeholder can be heard and still overridden. A principal changes what override requires.

This helps explain why symbolic governance is so persistent. Institutions do not turn to symbolism only because they are cynical or insincere. They turn to it because symbolism is grammatically compatible with existing architectures of power. Strategies, roadmaps, targets, consultations, dashboards, disclosures, ecosystem interfaces, and participatory processes all allow institutions to demonstrate responsiveness without fundamentally revising what is binding. They provide legitimacy signals at relatively low constitutional cost. As *From Symbolism to Authority* argued, symbolism persists because it solves an institutional problem: it allows organizations to appear responsible while preserving discretion. It widens the representational field without redistributing authority. In that sense, symbolic governance is not a superficial layer over an otherwise neutral system. It is the natural output of an anthropocentric grammar that can host ecological visibility more easily than ecological standing.

Environmental AI is especially vulnerable to being absorbed in this way. The previous paper was explicit on this point: dashboards proliferate because they are compatible with discretionary governance; scenario engines are commissioned because they can be cited without requiring action; ecosystem voices are welcomed because they create moral presence without forcing institutional redesign. Under the current grammar, AI enhances representation more easily than it alters obligation. It can make institutions appear more ecologically intelligent while leaving untouched the question of what ecological intelligence is allowed to do inside decision structures. The deeper danger is not simply that environmental AI becomes symbolic. It is that symbolic sophistication becomes a containment strategy: more data, more transparency, more participation, more voices, and still no standing.

Even Rights of Nature frameworks, where they exist, often encounter this grammar rather than escape it. A river may be granted legal recognition, guardians may be appointed, and ecological values may be affirmed in principle, yet institutional practice still struggles to treat

those recognitions as fully operative within budgeting, permitting, infrastructure planning, or administrative review. The problem is not that the moral argument has failed. It is that the procedural interface remains weak. Recognition enters a governance system still organized around human-centered standing, fragmented jurisdiction, discretionary balancing, and short-horizon incentives. The result is a familiar partial victory: symbolic recognition without strong enforcement pathways, or standing without durable institutional integration.

At this point the implication becomes clearer. Modern institutions do not fail at ecological representation simply because they have not yet learned to care enough. They fail because they are built around a constitutional picture of who appears, who claims, who counts, and what kind of injury becomes binding. The anthropocentric grammar of governance is not merely a bias in discourse. It is a design reality. It determines which claims arrive as obligations and which arrive as optional considerations. Under that grammar, ecosystems can be measured, mourned, and even celebrated without becoming represented principals. They remain present, but procedurally weak. They are invited into discourse as concerns, not admitted into governance as constraint.

This is why the ecosystem representation problem cannot be solved by better science alone, better participation alone, or better storytelling alone. Those interventions matter, sometimes profoundly. But each can be absorbed by institutions whose basic grammar remains unchanged. More evidence can be filed. More participation can be staged. More narratives can be celebrated. Unless the institutional constitution changes—formally through law, or functionally through standards and procedures that behave like constitutional constraints—ecological claims remain vulnerable to the same fate: acknowledged, translated, and ultimately subordinated. In that sense, the challenge is not merely to improve the inputs to governance, but to alter the terms under which governance recognizes a claim as non-optional.

The argument of this paper therefore turns at a precise point. If modern institutions fail because they are grammatically organized around stakeholders, interests, and discretionary balancing among human claims, then ecological legitimacy requires a different institutional figure. Ecosystems cannot remain only concerns within someone else's calculus. They must appear as represented principals.

## 4. Beyond Stakeholders

If modern governance fails at ecological representation because it is organized around human standing, discretionary balancing, and stakeholder negotiation, then the next question becomes decisive: under what institutional figure can ecosystems appear in a way that actually changes obligation? The answer proposed here is clear. Ecosystems cannot remain only concerns within someone else's calculus. They must be treated as represented principals. This is the threshold at which ecological legitimacy begins to move from expressive inclusion to institutional consequence. Without that shift, environmental governance remains trapped inside a framework that can hear nature, consult about nature, and advocate for nature while continuing to subordinate ecological integrity to the ordinary terms of political discretion.

The language of stakeholders has obvious appeal. It promises inclusion, dialogue, and procedural fairness. It acknowledges that many actors are affected by ecological decisions and that their interests should be heard. In environmental governance, this has often been treated as the progressive answer to exclusion: broaden the table, improve consultation, diversify participation, and ensure ecological concerns are represented through advocacy, expertise, and public process. These moves matter. They can correct blindness, expose conflict, and widen the moral and political field. But stakeholder logic has a limit that becomes impossible to ignore once ecological breakdown intensifies. Stakeholders express affected interests. They do not, by themselves, reorder the structure of duty.

This is the core weakness. Within stakeholder logic, ecosystems remain vulnerable to being translated into one interest among others. Their condition may be voiced eloquently and supported with strong evidence, but it still enters a field structured around balancing, bargaining, and discretionary trade-off. In such a field, ecological degradation can be acknowledged and still overridden. It can be regretted, compensated, deferred, or rhetorically prioritized while remaining procedurally negotiable. The institution can say that nature was considered, that stakeholders were consulted, that impacts were weighed, and that difficult trade-offs were made. The language is inclusive, but the ontology remains unchanged. Nature is still being processed as an input to human decision rather than as a source of claim that changes what decisions are legitimate to make.

This is precisely why *From Symbolism to Authority* insisted that the decisive shift is not from ignorance to awareness, but from option to obligation. A system becomes consequential when ecological signals cease to be voluntary inputs and begin to trigger duties to consult, respond, justify, mitigate, pause, or redesign. The same logic applies here. A stakeholder can be heard

without binding anyone. A principal changes the burden of justification. Once an ecosystem is treated as a represented principal, ecological harm is no longer merely an unfortunate side effect to be balanced against other goals. It becomes something owed explanation, something that can constitute breach, and something that institutions must publicly answer to when they depart from protective duty.

The distinction between stakeholder and principal is therefore not semantic. It is constitutional. A stakeholder framework asks: who is affected, and how should those interests be weighed? A principal framework asks: to whom or to what is duty owed, and what follows when that duty is at risk of violation? The first fits comfortably within the anthropocentric grammar of governance because it leaves discretion largely intact. The second begins to alter that grammar because it reorganizes legitimacy around obligations that are not reducible to negotiated preference satisfaction. Stakeholders can be overridden after consultation. Principals require justification when their integrity is compromised. Stakeholders enrich deliberation. Principals alter what deliberation is permitted to conclude without consequence.

This is also the practical meaning of the earlier paper's argument that ecological reality must enter the authorization layer of governance rather than remain at the informational layer. Information can support stakeholder negotiation. Authorization determines what counts as a legitimate outcome. If ecosystems remain only stakeholders by proxy, then environmental AI, guardianship structures, and ecological evidence can all be absorbed into advisory processes without changing the default presumption that development, extraction, or threshold crossing may proceed unless successfully contested. A principal framework reverses that logic. Ecological integrity becomes the baseline against which deviation must be justified. The burden shifts from defenders of ecological protection to those proposing harm. This is how "ecology before politics" becomes more than a slogan: it becomes a procedural ordering of duty.

At this point, the concept of represented principal matters enormously. The argument is not that ecosystems become principals by speaking in the same mode as human persons, nor that rivers, forests, estuaries, or wetlands must be anthropomorphized in order to count. Nor is the claim that AI itself should become the sovereign representative of nature. The claim is narrower and more defensible: ecosystems must be institutionally treated as entities to whom duties are owed and whose integrity is not exhausted by the aggregate preferences of human stakeholders. Representation is therefore not a mystical act of ventriloquism. It is a procedural translation of ecological integrity into standing, review, contestability, and burden-bearing obligation.

This procedural framing also helps avoid a common misunderstanding. To say that ecosystems should be treated as principals is not to deny that humans remain political agents, duty-bearers, and democratic participants. It is to insist that governance already recognizes many forms of represented interest and fiduciary obligation that are not reducible to immediate personal preference. Children, future beneficiaries, trusts, estates, public goods, and institutional mandates are often represented through structured duties rather than direct self-articulation. The existence of representation under conditions of asymmetry is not exceptional; it is foundational to much of law and governance. The real novelty here is not representation itself, but extending representational seriousness to ecosystems whose integrity conditions the possibility of social and political life. This is why the issue is not whether representation is pure, but whether it is designed well enough to be legitimate.

The alternative—keeping ecosystems in the stakeholder category—has consequences that are increasingly untenable. It means that ecological floors remain vulnerable to bargaining whenever short-term economic or political pressure rises. It means that institutions can satisfy procedural requirements through consultation, transparency, and reporting while preserving the same distribution of discretionary power. It means that environmental AI can proliferate as a highly articulate layer of visibility without changing what is non-negotiable. And it means that the living world remains dependent on the advocacy skills, political leverage, and moral imagination of human actors who must continually argue for why ecological loss should matter this time, in this case, under these pressures. That is not standing. It is permanent pleading.

A principal framework does not solve all conflict, but it changes the terrain on which conflict occurs. Once ecosystems are treated as represented principals, disagreement no longer takes place solely within a marketplace of competing interests. It takes place within a field of duty, breach, justification, and review. Institutions are still required to govern under complexity, and hard trade-offs do not disappear. But the justificatory structure changes. The question is no longer only whether enough stakeholders were consulted or whether enough benefits offset the costs. The question becomes whether the proposed action is consistent with duties owed to the represented ecosystem, whether ecological floors are being crossed, whether deviation is validly justified, and who has standing to challenge the answer. In this sense, principalhood does not eliminate politics. It constitutionalizes it.

This is the point at which ecological democracy begins to come into view. Democracy, under stakeholder logic, tends to mean expanding participation within a human-centered field of bargaining. Democracy, under principal logic, becomes something more demanding: a public

order in which some claims are not merely heard but institutionally structured as duties that shape what collective decisions can permissibly do. Ecosystems enter not as metaphorical members of the public, but as represented sources of constraint within public reason. That does not diminish democracy. It changes the conditions under which democracy remains legitimate on a damaged planet. A polity that can consult nature indefinitely while continuing to authorize its destruction is not more democratic for having widened the conversation. It is only more articulate in its failure.

The argument, then, is not that stakeholder processes should disappear. Consultation, participation, and plural input remain essential. But they are insufficient as the final institutional form of ecological legitimacy. They must be nested within a stronger architecture in which ecosystems are treated as represented principals whose integrity anchors obligations rather than merely informing preferences. Stakeholder inclusion can enrich the process; principal standing changes what the process must answer to. Without that distinction, environmental governance remains procedurally busy and constitutionally weak.

This shift—from stakeholder concern to represented principal—is the hinge on which the rest of the paper turns. If ecosystems are to appear as principals, then legitimacy depends on the conditions under which such representation is structured, tested, and contested. The next section therefore asks the practical question that follows: what makes ecosystem representation legitimate rather than romantic, technocratic, or captured? In other words, what are the actual conditions of legitimate ecological representation?

## 5. The Conditions of Legitimate Ecosystem Representation

If ecosystems are to be treated as represented principals rather than as stakeholder concerns by proxy, then the question of legitimacy can no longer remain abstract. The issue is no longer whether ecological representation is desirable in moral terms, but under what conditions it becomes institutionally defensible. This matters because the critique of anthropocentric governance does not by itself tell us how representation should be structured, and the rejection of stakeholder insufficiency does not yet explain how principalhood can avoid collapsing into romantic projection, elite capture, or technocratic substitution. Once ecosystems enter the space of governance as represented entities, legitimacy depends on the architecture through which that representation is authorized, constrained, tested, and revised. Representation is not made legitimate by declaration alone. It becomes legitimate through procedure.

This is where the argument of *From Symbolism to Authority* becomes especially important. That paper did not claim that authority emerges merely because an ecosystem is modeled, narrated, or recognized. Its sharper claim was that legitimacy requires both cultural recognition and procedural standing, and that structural systems differ from symbolic systems precisely because they enter the authorization layer of governance with traceability, contestability, review pathways, and the capacity to trigger obligation. The present section extends that logic. If legitimate ecosystem representation is to exist at all, it must be grounded in at least four conditions: **standing, duty, review, and contestability**. Together, these form the minimum grammar of non-symbolic representation.

### **The first condition is standing.**

Standing is the threshold condition because without it ecological claims remain merely advisory, however sophisticated their presentation. Standing means that the represented ecosystem has a recognized position within the decision architecture such that its condition can trigger procedural consequence. This does not require that ecosystems be assimilated to human legal personhood in identical form, nor that every governance system adopt the same legal doctrine. What it does require is that ecological claims be able to enter procedures in ways that matter: to trigger assessment, pause, review, redesign, mitigation, challenge, or refusal. In institutional terms, standing means that ecological integrity is not merely relevant information but a valid basis for action within a recognized process. A river that can be spoken for but not procedurally invoked does not yet have standing. A forest whose degradation can

be documented but cannot trigger obligation remains represented only symbolically. Standing is therefore the point at which ecological presence acquires procedural traction.

### **The second condition is duty.**

Standing alone is insufficient unless it is attached to obligations borne by identifiable institutions, officeholders, or decision-makers. A represented principal is meaningful only if someone owes that principal something. This is why the language of fiduciary duty is so important. Duties clarify that ecosystem representation is not just about being heard; it is about being owed care, protection, justification, and continuity. Duty transforms ecological integrity from an aspiration into a normative demand. Without duty, standing risks becoming ceremonial: an entity may appear in the process, yet no actor bears a structured obligation to protect its integrity, explain departures, or prioritize ecological floors. Duty also establishes asymmetry where it is needed. It marks that represented ecosystems are not merely one negotiable preference among others, but objects of obligation that reorder what institutions may permissibly sacrifice. In that sense, duty is what gives principalhood its operational force.

### **The third condition is review.**

Ecological representation is not legitimate if it is invocable only in theory but lacks pathways through which contested decisions can be reopened, examined, or challenged. Review is what prevents representation from being reduced to ceremonial acknowledgment. It ensures that ecological claims are not exhausted at the moment of initial consultation, but continue to matter when thresholds are crossed, evidence changes, harms accumulate, or prior assumptions prove false. Review also creates temporal depth. Ecological systems are dynamic, and governance decisions unfold over time; legitimacy therefore requires the ability to revisit authorization in light of ecological response rather than assuming that one procedural moment permanently settles the question. In practice, review means that ecological standing must be linked to triggers, thresholds, monitoring, appeals, and mechanisms for revisiting decisions under changing conditions. A governance order in which ecological claims can be voiced once but not re-enter the process as conditions evolve remains too static to be legitimate.

### **The fourth condition is contestability.**

This is essential because legitimacy is not achieved by removing disagreement, but by structuring it. The representation of ecosystems will always remain vulnerable to challenge: on evidentiary grounds, on normative grounds, on proxy grounds, on jurisdictional grounds. That

vulnerability is not a weakness to be eliminated. It is part of what makes representation legitimate in the first place. A system that claims to speak for nature without leaving room for challenge becomes opaque and paternalistic. A system that reduces ecological representation to endless debate without procedural consequence becomes politically empty. Contestability is the middle condition between those failures. It means that claims made on behalf of ecosystems must be traceable, challengeable, and publicly answerable, while still retaining the ability to generate obligation. In this way, contestability protects against both dogmatism and symbolism. It institutionalizes disagreement without allowing disagreement to dissolve standing back into optionality.

Taken together, these four conditions begin to define the difference between symbolic representation and legitimate representation. Symbolic systems may supply visibility and even voice, but they do not necessarily provide standing. Standing without duty becomes hollow. Duty without review becomes rigid or merely declarative. Review without contestability becomes technocratic. Contestability without standing collapses back into discussion without consequence. Each condition therefore depends on the others. What emerges is not a single institutional device, but a representational regime: a structured arrangement in which ecological claims can enter governance, bind duty-bearers, trigger revisitation, and remain open to challenge under public scrutiny. This is the procedural answer to the problem raised in earlier sections. Since no perfect spokesperson for nature exists, legitimacy must arise from the quality of the regime rather than the purity of the proxy. At this point, however, another requirement becomes visible:

### **The fifth condition evidentiary plurality.**

Ecosystems cannot be represented legitimately through a single epistemic channel alone. Scientific evidence is indispensable, but it is not exhaustive. Ecological claims also appear through historical memory, place-based observation, community experience, Indigenous knowledge, institutional records, legal principles, and long-duration patterns of degradation or care. A legitimate representational regime therefore cannot be built on one authoritative voice, whether scientific, legal, cultural, or computational. It must be capable of receiving, differentiating, and testing multiple forms of evidence without flattening them into a single metric of relevance. This is one reason the earlier paper's movement from symbolic systems to structural systems is so important: it implies not only stronger authority, but more carefully structured epistemic procedure. Representation becomes more legitimate not when one voice wins, but when multiple valid forms of ecological claim are organized into reviewable public reasoning. This in turn points to a further condition:

### **The sixth condition is public reason.**

If ecosystems are represented as principals, decisions affecting them must be justifiable in terms that are public, reviewable, and intelligible beyond the narrow circle of experts or institutional insiders. Public reason here does not mean that everyone must agree on value. It means that claims made on behalf of ecosystems cannot remain private judgments or black-box outputs. They must be articulated in forms that others can examine, challenge, and respond to. The legitimacy of ecological representation depends not only on whether a claim is made, but on whether the grounds of that claim are visible enough to be contestable without being trivialized. This links representation directly to explanation. A system that speaks for an ecosystem but cannot give reasons is authoritarian. A system that gives reasons but never binds anyone remains symbolic. Legitimate representation requires both.

### **The seventh condition is continuity across time.**

One of the core failures of anthropocentric governance is its tendency to reset ecological responsibility at each political cycle, procurement round, project phase, or leadership transition. Ecosystems, however, do not begin again each quarter. Their condition reflects cumulative pressures, long-duration injuries, and delayed responses. Legitimate representation must therefore possess continuity stronger than ordinary political attention. It must be able to preserve memory, track prior commitments, record deviations, and carry ecological claims across the discontinuities of human institutions. Without continuity, even formally recognized standing can decay into episodic symbolism. Representation becomes legitimate in part because it does not have to be re-won from zero at every moment of political convenience.

Once these conditions are assembled, the practical shape of legitimate ecosystem representation becomes clearer. It is not a matter of assigning nature a mascot, nor of declaring that one institution or one model has discovered how to speak authentically for the living world. It is a matter of designing a structure in which ecosystems can appear as principals through standing, duty, review, contestability, evidentiary plurality, public reason, and continuity. These are not supplementary features. They are the constitutional conditions under which representation ceases to be ornamental and becomes institutionally serious. The question "who speaks for nature?" is thus partially reframed. No single actor speaks conclusively for nature. Rather, a legitimate regime is one in which no actor can claim to speak for nature without being procedurally accountable for how that claim is formed, tested, revised, and challenged.

This is also the point at which Environmental AI can be judged more rigorously. The relevant question is no longer whether an AI system is compelling, intelligent, emotionally resonant, or technically impressive. The relevant question is whether it supports these conditions of legitimacy or undermines them. Does it strengthen standing or merely amplify visibility? Does it clarify duties or blur them? Does it create review pathways or simply produce outputs? Does it preserve contestability or hide authority behind technical complexity? Does it widen evidentiary plurality or flatten ecological claims into one dominant epistemology? An AI system that fails these tests may still be useful. But it does not yet belong to the institutional architecture of legitimate ecological representation.

The argument of this section can therefore be stated simply. Ecosystem representation becomes legitimate not because representation is philosophically pure, but because it is procedurally structured. What matters is not perfect authenticity, but whether the regime through which ecosystems are represented creates binding standing, allocates duty, enables review, preserves contestability, sustains evidentiary plurality, demands public reasons, and endures across time. These are the minimum conditions under which more-than-human representation can function as part of a democratic and institutional order rather than as a symbolic supplement to it.

The next question, however, is still the hardest one. **If legitimate ecosystem representation is a matter of regime design rather than pure proxy, then who actually occupies the representational role?** Through what actors, offices, benches, or institutions is ecological principalhood carried into governance? That is the problem of voice in institutional form, and it is the subject of the next section.

## 6. Who Speaks for Nature?

Once representation is understood as a matter of procedural legitimacy rather than symbolic expression alone, the most difficult question comes fully into view: who, in practice, speaks for nature? The question is unavoidable because no theory of ecological principalhood can remain persuasive if it avoids the problem of institutional embodiment. Ecosystems do not appear in governance unmediated. They are carried into institutions through guardians, experts, legal forms, monitoring systems, community claims, administrative procedures, and increasingly through digital and AI-mediated architectures. The issue is therefore not whether mediation exists, but what kind of mediation can be legitimate. The problem is not to eliminate proxy. The problem is to prevent proxy from becoming arbitrary, opaque, or politically unaccountable.

This is where debates about ecological representation often become unstable. On one side lies the temptation of authenticity politics: the search for the true speaker of nature, the figure who can claim to voice an ecosystem without distortion. On the other side lies the opposite temptation: the conclusion that because no pure proxy exists, representation is impossible or inherently illegitimate. Both positions are dead ends. The first asks too much of representation by demanding purity. The second asks too little of institutions by treating imperfection as grounds for resignation. Human governance already depends extensively on mediated representation under conditions of asymmetry. Children are represented. Future beneficiaries are represented. Public interests are represented. Fiduciary offices routinely act on behalf of entities that do not directly articulate their own claims in ordinary political speech. The relevant question is therefore not whether ecological representation is imperfect. It is whether its imperfection is governed well enough to be legitimate. This requires a decisive shift in framing.

**The question "who speaks for nature?" should not be answered with a single individual, office, or technical system. It should be answered with a representational regime. No guardian, scientist, community delegate, advocate, or AI system should be understood as the sole authentic voice of an ecosystem.**

Legitimate ecological representation emerges instead from an arrangement of roles, constraints, procedures, and review mechanisms through which ecological claims are formed, tested, translated, challenged, and carried into governance. This is the procedural answer to the proxy problem. Nature is not represented legitimately because someone has become nature's perfect spokesperson. It is represented more legitimately when no one can claim that role without being bounded by institutional duties, evidentiary discipline, public reasons, and contestable procedure.

Within such a regime, **guardians** play an important but limited role. The attraction of guardianship is clear. A guardian can serve as a fiduciary presence, a durable office charged with maintaining continuity, articulating ecological concern, and ensuring that ecosystem integrity is not silently subordinated to administrative expediency. In Rights of Nature contexts, guardianship often functions as the first institutional form through which ecosystems become more than symbolic entities. But guardianship alone is insufficient. A guardian may carry duty, but a guardian can also become vulnerable to projection, capture, politicization, under-resourcing, or over-personalization. If legitimacy rests too heavily on one guardian or one guardian body, representation becomes fragile. The question then reappears in another form: who guards the guardian, and by what standard?

This is why guardianship must be embedded in a wider constitutional structure. A guardian is best understood not as the final voice of nature, but as one office within a broader ecosystem of representation. Guardians can preserve continuity, escalate concern, and maintain fiduciary attention across political cycles, but they should not monopolize interpretation. Their legitimacy depends on the quality of the regime around them: the evidentiary standards they must work within, the procedural duties they must uphold, the review pathways through which their claims can be examined, and the institutional partners with whom ecological standing is operationalized. A guardian detached from such a regime risks becoming either symbolic or paternalistic. A guardian embedded within it can become a crucial stabilizing function.

The same is true of **experts**. Scientists, ecologists, hydrologists, social researchers, and legal scholars all contribute indispensable forms of knowledge to ecological representation. Yet expertise is not identical to representation. A scientist can describe threshold risk without holding fiduciary duty. A legal expert can map procedural options without carrying the burden of principal representation. An anthropologist can reveal place-based meaning without determining the obligations that follow. Expertise is necessary because ecological claims must be disciplined by reality. But expertise alone cannot resolve the representational problem because it does not by itself determine who or what is owed protection, how competing knowledge forms are integrated, or what institutional consequences should follow. Where expertise becomes sovereign, representation risks sliding into technocracy: the replacement of political legitimacy with epistemic authority alone.

At the other extreme, **community voice** is equally necessary but equally insufficient on its own. Communities carry situated knowledge, memory, observation, place attachment, histories of care, and often the first evidence of slow or cumulative ecological injury. Without community

voice, representation becomes abstract, extractive, and vulnerable to epistemic blindness. But communities do not speak as one, and local publics can themselves be internally unequal, conflict-ridden, or economically dependent on ecologically harmful practices. Community legitimacy therefore matters, but it cannot simply be romanticized into a singular authentic voice of place. Ecological representation requires communities, but cannot be reduced to them.

These limitations are precisely why the representational role must be **distributed** rather than singular. The strongest answer to the proxy problem is not a solitary representative but a **structured plurality of institutional roles**, each carrying a different form of authority and each constrained by the others. This is where the logic of the tri-bench becomes especially important.

*The Scientist, Anthropologist, and Advocate should not be understood merely as internal AI personas or stylistic voices. They are better understood as constitutional benches of representation, each tasked with carrying a distinct dimension of ecological principalhood into judgment.*

**The Scientist** bench does not "speak for nature" in the sense of moral voice. It speaks to ecological validity: conditions, thresholds, causal patterns, uncertainty, degradation pathways, and system dynamics. Its role is to ensure that ecological claims remain disciplined by evidence and that governance cannot simply ignore the physical and biological realities on which any legitimate decision depends.

**The Anthropologist** bench does not "speak for nature" in the sense of singular local authenticity. It speaks to situated meaning: the histories, relations, cultural understandings, lived observations, and representation gaps through which ecosystems are socially encountered. Its role is to prevent ecological representation from collapsing into technocratic abstraction or erasing the plural human worlds entangled with place.

**The Advocate** bench does not "speak for nature" as private moral passion. It speaks to duty, rights, procedure, and justificatory burden. Its role is to carry the represented ecosystem into the normative and institutional grammar of governance, asking what is owed, what is permitted, what is reviewable, and where deviation from ecological integrity requires explicit public justification.

Taken together, these benches do not solve the proxy problem by claiming purity. They solve it procedurally by distributing the burdens of representation across differentiated forms of authority. No single bench is sufficient. The Scientist without the Anthropologist becomes ecologically accurate but socially thin. The Anthropologist without the Advocate becomes richly interpretive but procedurally weak. The Advocate without the Scientist risks normative overreach unmoored from ecological reality. Legitimacy emerges not from one bench winning sovereignty over the others, but from their structured interaction under a regime of standing, duty, review, and contestability.

This distributed structure also helps clarify the role of AI systems within ecological representation. AI should not be treated as the speaker of nature in any singular or metaphysical sense. That framing would confuse mediation with principalhood and collapse legitimacy into technical performance. AI is better understood as part of the representational infrastructure: a means of carrying evidence, preserving continuity, surfacing patterns, coordinating benches, maintaining memory, and supporting public reasoning under conditions of complexity. Its legitimacy depends not on whether it appears eloquent or lifelike, but on whether it strengthens the representational regime rather than bypassing it. An ecosystem avatar may serve symbolic and communicative functions; a tri-bench AI system may serve procedural and analytical functions; but neither should be mistaken for nature itself. Their function is to support representation, not replace the constitutional question of how representation is authorized and constrained.

This matters because technological systems can easily intensify the proxy problem while pretending to solve it. A highly persuasive avatar can create the illusion that nature has been given a direct voice when in fact the system remains governed by hidden assumptions, training choices, corpus biases, and interface design decisions. A powerful decision-support system can obscure who is actually responsible for the judgments it produces. A synthetic voice can displace scrutiny by converting contestable ecological claims into rhetorically compelling outputs. For this reason, legitimate Environmental AI must be designed so that mediation remains visible. The point is not to erase the fact of translation, but to discipline it. Representation becomes more legitimate when the pathways by which ecological claims are formed are inspectable, plural, and open to challenge.

This is why institutional form matters as much as technical form. Ecological representation cannot be left to standalone systems, isolated guardians, or ad hoc consultation. It requires offices, benches, review mechanisms, public records, escalation pathways, and governance bodies capable of receiving ecological claims as more than advisory input. In practical terms,

this suggests a layered model. Guardians preserve continuity and fiduciary presence. Benches structure differentiated reasoning. Assemblies or decision forums provide a site for public justification. Review bodies or procedural triggers ensure that ecological claims can re-enter the process when thresholds are crossed or assumptions fail. AI operates within this arrangement as enabling infrastructure, not as sovereign decision-maker. The result is not a single voice of nature, but a constitutional ecology of representation.

At this point, the proxy problem can be reframed more precisely. The danger is not that humans mediate ecological claims. Mediation is unavoidable. The danger is that mediation remains unstructured, unaccountable, or monopolized by one epistemic form. A legitimate representational regime therefore does not promise to eliminate distortion. It promises to make distortion harder to hide, easier to contest, and less able to determine outcomes silently. That is a much stronger and more realistic standard. It replaces the impossible search for an unmediated voice of nature with the institutional demand for accountable mediation.

The implication is decisive. Who speaks for nature? Not one guardian. Not one expert. Not one community. Not one model. Not one AI. Nature becomes represented legitimately only when multiple bounded offices carry ecological claims into governance through procedures that distribute authority, preserve contestability, and make public justification possible. In that sense, the answer to the question is not a person but an architecture.

That architecture, however, cannot remain purely procedural in a narrow sense. If ecosystems are to be represented as principals, then the reasons given on their behalf must also become publicly intelligible and normatively assessable. The next section therefore turns from institutional carriers to justificatory form: what does public reason look like once ecosystems enter governance not as objects of concern, but as represented principals?

## 7. Ecological Public Reason

If ecosystems are to be represented as principals rather than merely consulted as concerns, then representation must change not only who appears in governance, but how decisions are justified. This is the next threshold. Standing, duty, review, and contestability establish the institutional conditions under which ecological claims can enter the process. But once they do, a further question immediately follows: by what standards are decisions involving represented ecosystems judged to be legitimate? The answer cannot be reduced to technical correctness alone, nor to majority preference, nor to the moral sincerity of decision-makers. It requires a more demanding account of public reason—one capable of operating under more-than-human conditions.

In its familiar political sense, public reason concerns the terms on which collective decisions are explained and defended in ways others can examine, contest, and live under despite disagreement. In ecological governance, that requirement becomes more difficult and more urgent. Decisions now involve not only competing human preferences, but represented principals that do not speak in ordinary political language, ecological thresholds that are not matters of opinion, and long-duration consequences that exceed immediate political horizons. Public reason cannot therefore remain anthropocentrically formatted while claiming to have incorporated ecosystems meaningfully. If it does, ecological claims will continue to be translated into advisory material, stakeholder sentiment, or technical appendices while the justificatory core of governance remains unchanged.

This is the deeper problem. Modern institutions often treat ecological evidence as something that informs decisions without structuring the logic by which those decisions are publicly defended. Reports are cited, risks are acknowledged, impact sections are appended, and mitigation language is added, yet the ultimate justification still tends to rest on familiar human-centered terms: economic necessity, political feasibility, proportional balancing, near-term public benefit, or managerial discretion. In that framework, ecology is present but secondary. It improves the informational environment, but not the grammar of legitimacy itself. From Symbolism to Authority was already clear that the central shift must occur when ecological reasoning moves from the informational layer to the authorization layer—when outputs become part of the record against which decisions are reviewed, contested, and either justified or delegitimized.

Ecological public reason begins from a different premise. It assumes that some ecological conditions are not merely values to be weighed, but constraints that shape what counts as a

legitimate decision in the first place. This does not mean politics disappears, nor that all ecological questions become scientifically self-evident. It means that public justification must be reformatted so that ecological integrity is not treated as optional context. If an ecosystem is represented as a principal, then decisions affecting it must be explainable in terms that address what is owed to that principal, what thresholds are implicated, what uncertainties remain, what harms are being imposed, and why any deviation from ecological protection is considered justifiable under conditions of duty. In other words, the burden of explanation changes.

This shift matters because the ordinary language of trade-off is often too weak for more-than-human legitimacy. Trade-off language assumes a field of commensurable interests in which competing claims can be balanced against one another through political judgment. But if ecosystems are represented principals, then not all losses remain describable as balanced compromises. Some become breaches of duty, threshold violations, or failures of fiduciary care that require stronger forms of justification than ordinary preference aggregation can provide. Public reason must therefore distinguish between cases where ecological claims are one relevant factor among others and cases where ecological floors constrain what is permissible at all. Without that distinction, principalhood collapses back into stakeholderism under a more sophisticated vocabulary.

*Ecological public reason is thus not simply "more ecological information in deliberation." It is a justificatory order with different demands. At minimum, four features define it.*

**The first is threshold-awareness.** Public reasons in ecological governance must be able to distinguish between desirable outcomes and non-negotiable floors. This is one of the central implications carried forward from *From Symbolism to Authority*: ecological thresholds become politically consequential only when they are treated as non-optional constraints rather than flexible guidance. A public justification that acknowledges a threshold breach while continuing as though the breach were merely one consideration among many is not yet ecological public reason. It is discretionary reasoning with ecological decoration.

**The second is fiduciary orientation.** If ecosystems are represented through principalhood, then reasons given in public must reflect not only what is advantageous, popular, or feasible, but what is owed. Fiduciary reasoning does not eliminate trade-offs, but it changes their moral structure. The question is no longer only "what outcome best serves current interests?" It becomes "what course of action is consistent with duties owed to the represented ecosystem, and what justification is sufficient if those duties are compromised?" This is precisely the shift the previous paper associates with mandate-bearing environmental AI: institutions become

answerable not simply for what they prefer to do, but for why they believe deviation from ecological constraint is warranted.

**The third is traceable explanation.** Public reason under more-than-human conditions cannot rely on opaque assertions, informal balancing, or black-box optimization. If ecological claims are to bind, then the reasons through which they are interpreted must be inspectable. What evidence was used? What assumptions were made? Which thresholds were considered binding, uncertain, or revisable? Why was one form of knowledge weighted as it was? How were dissenting views handled? From Symbolism to Authority insisted that authority-oriented systems require reasoning logs, transparency about uncertainty, versioning, mechanisms for dissent and appeal, and outputs that become part of the public record. Ecological public reason is the normative counterpart of that architecture. It demands that justification be visible enough to be challenged without being reduced to spectacle.

**The fourth is asymmetry-consciousness.** Ecosystems do not participate in public justification as human citizens do. Their claims are mediated, translated, and institutionally carried by others. Ecological public reason must therefore remain conscious of representational asymmetry rather than pretending it has disappeared. This means reasons offered on behalf of ecosystems must be disciplined by procedures that acknowledge proxy limits, evidentiary plurality, and the possibility of distortion. A valid justification cannot simply declare that "nature wants" a particular outcome. It must show how the claim was constructed, through what evidence, by what offices, under what duties, and subject to what review. This is not a weakness of ecological public reason. It is one of its essential safeguards.

These features together clarify why public reason under more-than-human conditions cannot be collapsed into either technocracy or sentiment. Technocracy fails because it assumes ecological legitimacy can be derived from expertise alone. But expertise, however indispensable, does not by itself answer questions of duty, permissible sacrifice, or democratic justification. Sentiment fails because moral resonance, empathy, and symbolic presence may deepen care without structuring what institutions must do. Ecological public reason occupies the harder middle ground. It insists that valid justification must be empirically disciplined, normatively articulated, procedurally visible, and institutionally contestable all at once.

This is where the distributed architecture of representation becomes indispensable. The Scientist bench contributes ecological validity and threshold logic. The Anthropologist bench contributes situated meaning, historical context, and the social conditions under which a decision will be lived and interpreted. The Advocate bench contributes duty, procedural

relevance, rights claims, and justificatory burden. None of these on its own constitutes ecological public reason. Together, however, they begin to form the architecture through which more-than-human justification becomes possible. Public reason is not the output of one bench; it is the disciplined synthesis of differentiated authority.

The importance of this synthesis becomes especially clear under conditions of friction. Hard cases will rarely involve universal agreement. Institutions will face pressures to reinterpret thresholds as flexible targets, to downgrade warnings as uncertain, to privilege immediate human benefits, or to relocate decisions into less accountable venues. From Symbolism to Authority argues that these moments of resistance are not signs that legitimacy has failed, but proof that ecological constraint has entered the field of power. Ecological public reason is what determines whether such conflicts are processed as accountable disagreement or whether they dissolve back into informal bargaining. When justifications must be given publicly, tied to duties, and recorded against reviewable thresholds, conflict becomes a site of democratic testing rather than a license for silent override.

This is also why ecological public reason must include the possibility of **dissent**. A governance system that claims ecological legitimacy while forcing unified output at all times risks becoming artificial in the worst sense: neat, authoritative, and deeply untrustworthy. Disagreement among benches, guardians, institutions, or publics should not automatically be treated as system failure. In many cases, preserved dissent is what makes legitimacy possible. It shows where uncertainty remains, where proxy limits are biting, where values are in tension, and where a decision proceeds despite unresolved ecological concern. The previous paper's emphasis on recording dissent and building appeal pathways is therefore not a technical footnote. It is integral to what public reason becomes once represented ecosystems enter the justificatory field.

At the same time, ecological public reason must avoid becoming an endless discourse that never binds. This is the opposite danger. If justification expands without procedural consequence, public reason becomes another layer of symbolic governance: more explanation, more deliberation, more visibility, and still no standing that survives pressure. The point is not merely to improve the quality of ecological argument. It is to make those arguments matter institutionally. Ecological public reason therefore differs from deliberative enrichment alone. It is tied to thresholds, duties, and review pathways that can make a justification valid, insufficient, challengeable, or illegitimate in practice.

The democratic significance of this shift is substantial. Under anthropocentric conditions, democracy often appears as a system for negotiating among human claims within a shared procedural frame. Under more-than-human conditions, democracy must also ask whether the frame itself is legitimate when ecosystems remain only objects of management. Ecological public reason does not abandon democracy. It deepens its demands. It asks whether collective self-government can remain legitimate while authorizing forms of ecological injury that undermine the conditions of collective life itself. In that sense, ecological public reason is not an anti-democratic supplement to governance. It is part of what democracy must become if it is to govern under conditions of biospheric dependence rather than ecological denial.

The result is a new standard for justification. A decision affecting a represented ecosystem is legitimate not simply because it was legally authorized, politically expedient, or supported by a majority. It is legitimate only if the reasons given for it are ecologically literate, fiduciary in orientation, procedurally visible, open to contestation, and adequate to the duties owed under conditions of more-than-human representation. That is a stricter standard than most institutions currently meet. But it is also the only standard under which ecosystem principalhood ceases to be rhetorical and begins to operate within governance as a real constitutional condition.

From here, the wider political implication becomes unavoidable. If public reason itself must be reformatted under more-than-human conditions, then the democratic order within which it operates must also change. The next section therefore turns to that broader question: what kind of democracy emerges once ecosystems are no longer merely protected objects or consulted interests, but represented principals within the legitimacy architecture of governance?

Once ecosystems are treated as represented principals, and once public reason is reformatted to account for duties owed under more-than-human conditions, the implications can no longer be contained within environmental policy alone. The issue becomes constitutional in the fullest sense. It concerns not simply how institutions manage ecological questions, but how legitimacy itself is organized in a polity whose material conditions are biospheric rather than abstract. This is the threshold at which ecological representation becomes ecological democracy. The term should be used carefully. It does not mean merely adding nature to existing democratic procedure, nor expanding stakeholder participation to include more ecological voices. It means reorganizing the structure of public legitimacy so that ecological integrity is no longer treated as an external concern to politics, but as part of the conditions under which politics remains legitimate at all.

This distinction is crucial because democratic systems often understand themselves through a procedural ideal of inclusion among human claimants. On that view, legitimacy derives from participation, authorization, accountability, and contestation among persons and constituencies recognized within the political community. Ecological concerns may be incorporated as policy issues, moral priorities, or expert advisories, but they do not typically alter the underlying picture of who the polity is for, what obligations the polity carries, and what kinds of harm are considered constitutionally disqualifying. Environmental questions therefore enter democracy as content, not as structure. Ecological democracy begins where that arrangement becomes inadequate. It asks what democracy becomes when the living systems that sustain collective life are no longer treated as background conditions or managed resources, but as represented principals whose integrity shapes the terms of legitimate rule.

Under this view, the central problem with conventional democratic practice is not simply that it fails to care enough about nature. It is that it remains organized around a form of legitimacy that presumes the biosphere to be politically downstream. Ecological damage is processed as policy externality, distributive side effect, or future risk to be balanced against present demand. But once ecosystems are understood as represented principals, that ordering becomes unstable. The question is no longer whether ecological costs are high enough to justify concern. The question is whether a democratic order remains legitimate if it authorizes forms of degradation that undermine the conditions of life, continuity, and collective agency on which democratic legitimacy itself depends. Put differently: a polity cannot plausibly claim self-government while systematically degrading the ecological basis of the self that governs.

Ecological democracy therefore does not abolish democratic values. It reorders them around a more truthful account of dependence. Participation still matters. Accountability still matters. Contestation still matters. Public justification still matters. But these values can no longer operate as though biospheric conditions were optional background variables. They must be exercised within a constitutional field in which ecological floors, fiduciary duties, and represented more-than-human claims shape what democratic choice is permitted to do. The shift is subtle in form and radical in consequence. Democracy remains a system of collective self-rule, but the "self" is no longer imagined as a purely human will acting upon inert surroundings. It is reconceived as a political formation embedded in and dependent upon living systems whose integrity places real limits on legitimate discretion.

*This is why the movement from stakeholder concern to principal representation is so important.*

A democracy organized only around stakeholder inclusion can become highly participatory while remaining ecologically permissive. It can consult widely, deliberate thoroughly, and still authorize degradation so long as enough interests are balanced, enough compensation is offered, or enough procedural boxes are checked. In such a system, ecological legitimacy is always vulnerable to being traded away under pressure. Ecological democracy requires a stronger architecture. It requires that some ecological claims enter not merely as interests to be heard, but as constraints that shape the boundaries of acceptable collective action. This does not eliminate politics. It constitutionalizes the material conditions under which politics can remain legitimate.

A useful way to put this is that ecological democracy reorganizes legitimacy around biospheric constraint. Constraint here should not be confused with authoritarian closure or anti-political rigidity. Every constitutional order already operates through constraint. Rights constrain majority will. Due process constrains expedience. Jurisdiction constrains institutional overreach. Ecological democracy extends this constitutional insight into the domain of Earth-system dependence. It argues that there are conditions of ecological integrity that democratic decision-making must answer to, not because democracy is weakened by limits, but because legitimacy always depends on the proper relation between freedom and the conditions that make freedom possible. If a polity may democratically choose to destroy the living systems on which its continuity depends, then democracy has confused sovereignty with self-erosion.

This reorganization of legitimacy carries several implications.

First, it alters the meaning of public interest. Under conventional anthropocentric governance, the public interest is often framed as the aggregate or negotiated outcome of human needs, preferences, welfare, and security concerns. Ecological democracy widens that frame by recognizing that the public interest cannot be coherently defined against the ecological conditions of collective existence. The health of a river basin, the resilience of soils, the integrity of estuaries, the continuity of pollination systems, the stability of hydrological cycles—these are not side issues to the public interest. They are part of its material substrate. A democracy that brackets them as environmental “considerations” misdescribes its own basis of legitimacy.

Second, it alters the meaning of representation. Representation no longer refers only to the distribution of voice among human constituencies. It becomes the structured inclusion of represented principals whose claims do not arise from electoral preference but from ecological dependence, fiduciary duty, and institutionalized standing. This is not a departure from democracy into post-democratic technocracy. It is a recognition that democratic legitimacy has always depended on forms of mediated representation that exceed direct self-expression. The novelty is not mediation itself, but extending mediated seriousness to ecosystems whose condition is politically constitutive.

Third, it alters the meaning of accountability. In a conventional democratic frame, accountability often runs upward to voters, sideways to institutions, and outward to law. Ecological democracy adds another axis: accountability to ecological floors, represented ecosystems, and duties carried across time. This does not replace electoral accountability, but it means that some decisions cannot be legitimated solely by popularity, mandate, or procedural compliance if they breach more-than-human obligations. Accountability becomes thicker because institutions must answer not only for whether a decision was authorized, but for whether it was ecologically defensible under conditions of duty and constraint.

Fourth, it alters the meaning of time in democratic life. Ecological democracy cannot be confined to the temporal rhythms of campaign cycles, annual budgets, and short-run political incentives. It requires institutions capable of carrying ecological memory, long-duration responsibility, and intergenerational duty across the discontinuities of ordinary politics. This does not mean suspending democratic renewal. It means embedding continuity functions strong enough to prevent ecological standing from being reset to zero whenever political convenience shifts. The previous paper’s emphasis on continuity, auditability, update governance, and difficult-to-bypass procedural pathways is highly relevant here. Ecological democracy requires not just more ecological values, but institutions able to remember.

Fifth, it alters the meaning of conflict. In ecological democracy, conflict does not disappear. Development pressures, livelihood concerns, infrastructure needs, and environmental protections will continue to collide. But the terms of conflict change. The dispute is no longer only among competing human interests. It includes the question of what is owed to represented ecosystems, where ecological floors lie, and whether proposed deviations are publicly justifiable. Conflict becomes more constitutionally structured, less dependent on ad hoc bargaining, and more open to forms of dissent that record when decisions proceed despite unresolved ecological breach.

This last point matters because ecological democracy should not be mistaken for harmony politics. It is not a vision in which human and ecological claims naturally align once institutions become enlightened. Often they will not. The value of ecological democracy lies elsewhere: in refusing to process those conflicts through institutions that treat the biosphere as negotiable background. It creates a public order in which some forms of sacrifice become harder to rationalize, more procedurally costly, and more visible as legitimacy failures rather than normal outputs of growth-oriented governance. This is exactly the kind of shift anticipated in *From Symbolism to Authority*, where ecological AI becomes meaningful not when it persuades more effectively, but when it becomes part of accountability infrastructure that institutions must either follow or openly override.

At this point, it becomes easier to see why ecological democracy is not simply an environmental add-on to liberal democracy, but a pressure on its inherited assumptions. Liberal institutions are extraordinarily effective at representing persons, aggregating interests, protecting rights, and regulating conflict within human-centered terms. Their weakness is not democratic procedure as such, but the assumption that democracy can remain legitimate while treating ecological dependence as an external policy variable. Ecological democracy does not reject procedural democracy; it subjects it to a reality test. It asks whether democratic legitimacy is credible if the institutions of self-rule cannot represent the living systems whose degradation progressively undermines the basis of self-rule itself.

This is where the broader concept of **symbiocracy** also becomes intelligible. If ecological democracy names the reorganization of legitimacy around more-than-human representation and biospheric constraint, symbiocracy can be understood as the further maturation of that order into a political form explicitly organized around mutual flourishing, nested interdependence, and fiduciary relation rather than extractive sovereignty. Ecological democracy may be the transitional constitutional language; symbiocracy may be the civilizational horizon. The distinction need not be settled here. What matters for present

purposes is that both point in the same direction: away from governance that merely consults ecological reality, and toward governance that is institutionally answerable to it.

Environmental AI becomes relevant within this horizon only under strict conditions. Its role is not to define democracy from the outside, nor to replace human political judgment with algorithmic administration. Its role is to support the representational and justificatory architecture through which ecological democracy becomes operational: preserving memory, coordinating differentiated benches, surfacing threshold conditions, recording dissent, and carrying ecological claims into public reason in forms institutions cannot easily neutralize. Outside that architecture, Environmental AI risks serving a familiar function—making ecological politics more expressive while leaving democratic legitimacy unchanged. Inside it, AI may help make ecological democracy administratively real.

The claim of this section can therefore be stated simply. Ecological democracy begins when ecosystems cease to be treated merely as protected objects, valued resources, or stakeholder concerns, and become represented principals within the legitimacy architecture of governance. At that point, democracy is no longer defined only by how well it aggregates human claims, but by how truthfully it governs under conditions of biospheric dependence. The question is no longer whether democracy includes nature in the conversation. It is whether democracy can remain legitimate while excluding nature from the structure of obligation.

This, however, does not remove the need for caution. A project this ambitious must be clear about its limits, its risks, and what it does not claim to resolve.

Any proposal to represent ecosystems as principals within governance must confront a predictable set of objections. Some are philosophical, some institutional, some political, and some strategic. They cannot be treated as peripheral. In fact, one of the clearest signs that a theory of ecological representation is becoming serious is that it begins to attract the right kind of resistance. That resistance often names genuine risks. A project of this kind can slide into technocracy, hide behind moral symbolism, become vulnerable to proxy capture, or provoke entirely justified worries about the weakening of democratic accountability. These dangers are real. The argument of this paper is not that ecological representation dissolves them. It is that refusing representation does not avoid them either. It merely leaves modern institutions operating within an anthropocentric grammar that already produces ecological misrecognition while disguising its own exclusions as neutral procedure.

The first and perhaps most immediate objection is **technocracy**. If ecosystems are represented through experts, structured benches, thresholds, fiduciary duties, and AI-supported systems of ecological reasoning, does governance not risk becoming rule by specialists? Does the language of ecological constraint simply hand political authority to scientists, modelers, legal architects, and system designers under a new moral vocabulary? The concern is understandable. Modern governance has a long history of converting public questions into technical ones and then treating contestation as ignorance or obstruction. A theory of ecological representation that merely replaces democratic conflict with epistemic management would deserve criticism.

But that is not the claim being made here. The paper does not argue that expertise should replace politics. It argues that politics becomes illegitimate when it is structured in ways that can systematically override ecological reality without consequence. Expertise is indispensable because ecosystems are not intelligible without disciplined knowledge of thresholds, cumulative pressures, and system dynamics. But expertise alone cannot determine legitimacy, because legitimacy also depends on fiduciary duty, public reason, review, dissent, and representational accountability. This is precisely why the representational regime proposed here is plural rather than technocratic. The Scientist bench is necessary, but not sovereign. The Anthropologist and Advocate exist in part to prevent ecological validity from being mistaken for sufficient political legitimacy. The risk of technocracy is real; the answer is not to abandon ecological representation, but to constitutionalize expertise so that it remains bounded, contestable, and publicly answerable.

A second objection is **romanticism**. Does the call to represent ecosystems as principals not risk projecting human meanings, desires, and moral fantasies onto the nonhuman world? Is this not simply a sophisticated form of anthropomorphism dressed up as constitutional theory? Again, the danger is genuine. Nature has often been idealized, ventriloquized, and symbolically mobilized in ways that obscure complexity, erase conflict, or sacralize ecological entities beyond critique. A river can easily become a moral screen onto which human actors project purity, innocence, wisdom, or political convenience. Under those conditions, representation becomes sentimental rather than rigorous.

This paper rejects that route. It does not claim that ecosystems possess human-style intentionality, nor that representation becomes legitimate because nature is given an emotionally compelling voice. On the contrary, much of the argument has been built precisely on the insufficiency of symbolic presence. The point is not to romanticize ecosystems into pseudo-subjects of moral theater. It is to develop institutional forms adequate to the fact that ecological integrity matters in ways current governance cannot properly register. The move from stakeholder to principal is not a claim about emotional identification. It is a claim about duty and standing. If anything, the paper is anti-romantic in one specific sense: it insists that care without procedure remains politically weak. The danger of romanticism is best addressed not by retreating into managerial realism, but by building representational forms that are evidentially disciplined, publicly reasoned, and procedurally constrained.

A third objection concerns **proxy capture**. Even if one accepts that ecosystems require representation, how can one prevent those who claim to speak for nature from simply advancing their own interests under ecological cover? Guardians may become politicized. Experts may privilege their own methodologies. Community representatives may reflect local power asymmetries. NGOs may strategically moralize ecological claims. AI systems may encode hidden biases, training assumptions, or institutional priorities while presenting themselves as neutral mediators. In other words, does ecological representation not simply create a new arena in which the old problem of power reappears under greener language?

The answer is yes: the risk of capture is unavoidable. But this does not refute representation. It clarifies the conditions under which representation can become legitimate. Capture becomes more likely when representational authority is singular, opaque, weakly reviewable, or insulated from challenge. That is precisely why the paper argues for a distributed regime rather than a pure spokesperson. No guardian, bench, or AI system should possess unchecked representational authority. Legitimate representation requires institutional pluralization, traceable evidence, public reasoning, review pathways, and preserved dissent. The goal is not

to design a system in which capture becomes impossible. The goal is to design one in which capture is harder to hide, easier to challenge, and less able to determine outcomes silently. This is a more realistic and more constitutional standard.

A fourth objection is explicitly **anti-democratic**: does representing ecosystems as principals not subordinate democratic self-rule to ecological doctrine? If some ecological floors become non-negotiable, has democracy not been displaced by a constitutionalized environmentalism that limits what publics may choose? This is perhaps the most politically charged concern, because it touches the deepest democratic intuition: that collective self-government requires the authority to decide collectively, even at significant cost.

The response must be careful. Ecological democracy does indeed constrain democratic discretion. But this is not unique. All serious democratic orders constrain collective will in some form. Rights constrain majorities. Rule of law constrains expedience. Constitutional protections constrain immediate preference satisfaction. Due process constrains efficiency.

Intergenerational obligations and public trust doctrines already limit what can be permissibly traded away. The real question is not whether democracy should be constrained, but which constraints are necessary for democracy to remain legitimate under conditions of biospheric dependence. A polity that claims the democratic right to destroy the ecological conditions of its own continuity is not exercising freedom in a meaningful constitutional sense. It is mistaking self-rule for self-erosion. Ecological principalhood therefore does not abolish democracy; it identifies a domain in which democratic legitimacy depends on acknowledging real material limits rather than treating them as optional policy inputs.

Still, there is a related danger of **constitutional overreach**. One can imagine ecological claims being expanded so broadly that nearly every policy disagreement is reframed as a biospheric necessity, thereby hollowing out ordinary democratic decision-space. This too must be resisted. Not every environmental concern should automatically become a constitutional floor. Not every ecological preference should override distributive, social, or democratic considerations. The distinction between ecological relevance and ecological non-negotiability must itself be argued publicly and carefully. That is one reason threshold-awareness is so important. A legitimate ecological order must differentiate between cases where ecological integrity sets hard limits and cases where ecological considerations remain important but negotiable within a broader field of judgment. If every claim becomes absolute, legitimacy will erode under the weight of overclaiming.

Another objection concerns **institutional feasibility**. Critics may argue that the framework described here is normatively ambitious but practically fragile: too complex, too layered, too demanding of bureaucracies already stretched thin. Standing, fiduciary duty, benches, review pathways, public reason, continuity, dissent, and AI-mediated support may appear, taken together, like an architecture easier to describe than to implement. This concern should not be dismissed. Institutional complexity is itself a political problem, and governance systems overloaded with process can become ineffective or exclusionary.

Here the paper should be explicit about what it does not claim. It does not claim that all parts of this framework must appear at once, everywhere, in maximal form. Nor does it claim that every jurisdiction requires identical institutional design. The argument is architectural rather than uniform. It identifies the conditions under which ecosystem representation becomes legitimate, not a single blueprint to be copied mechanically. Different legal systems, governance cultures, and ecological contexts will institutionalize these conditions differently. The burden of the argument is therefore not that all institutions must look the same, but that institutions that aspire to represent ecosystems legitimately must satisfy the same underlying functions: standing, duty, review, contestability, evidentiary plurality, public reason, and continuity.

A further objection concerns **AI itself**. Given the history of automation bias, algorithmic opacity, data extraction, and techno-solutionist overreach, why should Environmental AI be trusted as part of a legitimacy architecture at all? Is it not more plausible that AI will intensify existing power asymmetries rather than correct them? This objection is particularly important because the present paper is situated within a broader project that explicitly involves AI-mediated ecosystem representation.

The answer, again, is restrictive rather than celebratory. This paper does not claim that AI confers legitimacy. It does not claim that AI speaks for nature. It does not claim that computational systems can solve the moral problem of ecological representation by virtue of scale, speed, or pattern recognition. On the contrary, the argument only licenses Environmental AI under conditions of procedural subordination. AI may support memory, retrieval, coordination, threshold detection, public explanation, and continuity across complex governance environments. But where AI obscures mediation, centralizes authority, flattens evidentiary plurality, or weakens contestability, it becomes part of the problem rather than part of the solution. The correct standard is not whether AI is powerful, but whether it remains constitutionally bounded.

There is also the objection of **plural worldviews**. What happens in contexts where different communities understand ecosystems through fundamentally different ontologies—scientific, legal, cosmological, Indigenous, spiritual, local, extractive, or restorative? Does the effort to create one representational regime risk imposing a singular epistemology under the language of legitimacy? This is a serious challenge, and one reason any serious ecological politics must remain wary of universalizing too quickly.

The framework developed here does not resolve ontological conflict. It is not a theory of final metaphysical agreement. It is a theory of procedural legitimacy under conditions of pluralism and ecological dependence. That is a narrower and more defensible claim. The point is not to erase worldview difference, but to create institutional forms capable of receiving plural forms of ecological claim without collapsing them all into either scientific positivism or cultural relativism. This is why evidentiary plurality and contestability are so central. Legitimate representation must remain open enough to incorporate multiple modes of ecological relation while structured enough to prevent that plurality from dissolving into arbitrary assertion. At this point, it is helpful to state several **non-claims** clearly.

This paper does **not** claim that ecosystems can be represented without distortion. It does **not** claim that one guardian, one community, one expert class, or one AI system can serve as nature's authentic voice. It does **not** claim that ecological representation ends political conflict. It does **not** claim that all ecological harms are constitutionally non-negotiable in the same way. It does **not** claim that AI is inherently legitimate, neutral, or emancipatory. It does **not** claim that liberal-democratic institutions can be transcended by technical design alone. And it does **not** claim that a complete theory of symbiocentric governance is finished once ecosystem standing is articulated.

What it does claim is more limited and more serious: that without a theory of legitimate ecosystem representation, Environmental AI remains vulnerable to symbolism, Rights of Nature remains vulnerable to procedural weakness, and democracy remains vulnerable to governing as though biospheric dependence were politically optional. The purpose of this paper is therefore not to resolve all downstream questions. It is to identify the threshold that cannot be skipped. That threshold is representation structured by legitimacy rather than sentiment, purity, or convenience. Once that is accepted, a final practical question returns with force: what does all of this imply for Environmental AI itself? How should systems like ENVAI be understood if legitimacy depends not on visibility alone, but on standing, duty, review, contestability, and public reason?

If the argument of this paper is correct, then the implications for Environmental AI are immediate and sobering. The central question is no longer whether AI can render ecosystems more visible, more interactive, more emotionally resonant, or more analytically sophisticated. It clearly can. The question is whether such systems participate in a legitimate representational order, or whether they merely intensify visibility while leaving standing unchanged. Put differently: the decisive distinction is no longer between low-tech and high-tech environmental governance, but between **representation** and **automation**. Environmental AI becomes institutionally meaningful only when representation comes first.

This point is easy to miss because AI systems are often assessed in terms of performance rather than constitutional role. One asks whether a system is accurate, fluent, scalable, engaging, explainable, or useful. These are important questions, but they are downstream from the more basic issue raised in this paper: what is the system actually doing inside governance? Is it helping an ecosystem become a represented principal with procedural standing, or is it simply making ecological information more available to institutions that remain free to ignore it? Is it strengthening duty, review, and contestability, or is it adding another layer of advisory sophistication to an unchanged structure of discretion? These are not secondary design questions. They are the primary tests by which Environmental AI should be judged.

The first implication is therefore conceptual: **Environmental AI is not itself a source of legitimacy**. No degree of technical sophistication can substitute for the political and procedural conditions developed in the preceding sections. An avatar does not create standing because it is compelling. A model does not create duty because it is accurate. A dashboard does not create review because it is real-time. A language interface does not create ecological public reason because it sounds articulate. Legitimacy is not generated by interface quality, data richness, or model complexity. It is generated, if at all, by the institutional regime within which those systems operate: whether ecological claims can enter decisions as constraints, whether duties are allocated, whether reasons must be given publicly, whether dissent can be preserved, and whether ecological standing survives contact with political pressure.

This leads to the second implication: **most current Environmental AI remains pre-constitutional**. Even where technically impressive, many systems still operate at the level of enhanced legibility rather than represented principalhood. They improve sensing, forecasting, visualization, scenario analysis, and public communication. They may support better stewardship and better policy. But unless they are connected to standing, duty, review, and

contestability, they remain located in the informational layer of governance. They can inform, warn, narrate, and advise without altering what institutions are required to do. This does not make them useless. It means they should be understood correctly: as preparatory or symbolic systems unless and until they are embedded in stronger authorization structures. From Symbolism to Authority already made this distinction sharply. The contribution of the present paper is to show that the missing bridge is representation.

The third implication is architectural: **Environmental AI must be designed backward from consequence.** The starting point should not be "what can the model do?" but "what procedural role must this system play if ecological claims are to count?" This reverses a common development logic. *Instead of beginning with capabilities and then searching for use cases, legitimate Environmental AI begins with representational function.* Does the system support standing by making ecological claims procedurally invocable? Does it support duty by clarifying who owes what to the represented ecosystem? Does it support review by maintaining triggers, thresholds, memory, and pathways for reopening decisions? Does it support contestability by exposing assumptions, preserving dissent, and making outputs challengeable? A system that cannot answer these questions positively may still be valuable as an educational or analytic tool, but it should not be mistaken for governance infrastructure.

The fourth implication concerns **role differentiation.** If ecosystems are represented through plural, bounded offices rather than singular proxies, then Environmental AI should not be built as one generic intelligence layer speaking in one synthesized voice. It should be built to reflect differentiated forms of authority. *Scientific evidence, situated meaning, and normative duty do not arise from the same corpus, the same method, or the same justificatory logic.* An AI system that collapses them too early risks reproducing exactly the representational weakness this paper diagnoses: apparent pluralism masking epistemic monism. This is why the next paper, Constitutional Retrieval, becomes necessary. Once representation is understood as a legitimacy problem, machine architecture itself must be redesigned so that differentiated authority survives implementation. The technical question is downstream from the political one, but it follows inexorably from it.

The fifth implication is procedural: **Environmental AI must be built for audit, not just output.** In conventional product terms, a system is often evaluated by the quality of its answer. In a legitimacy architecture, that is insufficient. What matters is whether the pathway to the answer is inspectable enough to support standing, review, contestability, and public reason. This requires provenance, versioning, reasoning traces, confidence disclosure, source differentiation, record-keeping, escalation pathways, and explicit treatment of uncertainty.

*From Symbolism to Authority* argued that authority-bearing systems must privilege traceability, contestability, reasoning logs, update governance, and mechanisms for dissent and appeal. The present argument sharpens why: without these features, Environmental AI may generate ecological claims, but it cannot support their legitimate representation within governance.

The sixth implication concerns **memory and continuity**. One of the reasons ecosystems remain procedurally weak is that institutions forget. Leadership changes, priorities shift, projects restart, procurement cycles end, and ecological claims must repeatedly be made anew. Environmental AI can be valuable here, but only if designed as continuity infrastructure rather than episodic assistance. That means preserving ecological history across cases, maintaining records of prior commitments, tracking deviations from thresholds or fiduciary obligations, and ensuring that representation does not have to be reconstructed from zero each time a new process begins. AI is especially relevant when it acts as a durable carrier of ecological memory across fragmented administrative time. Without that continuity function, it risks becoming just another project-layer technology: temporarily impressive and structurally forgettable.

The seventh implication concerns **the visible status of mediation**. A major temptation in Environmental AI is to make mediation disappear—to create the impression that nature is now “speaking directly” through a highly persuasive interface. This is dangerous. It encourages users to confuse representational infrastructure with unmediated voice and makes it harder to see where training choices, corpus selection, design framing, and institutional assumptions are shaping outputs. *Legitimate Environmental AI should therefore make mediation more inspectable, not less. It should show how ecological claims are assembled, which evidentiary streams are involved, where uncertainty lies, what normative assumptions are in play, and which parts of the output remain contestable.* The goal is not to produce the illusion of directness, but to discipline translation.

The eighth implication is **organizational: Environmental AI should be treated less like a product and more like an office-bearing infrastructure**. This is a substantial shift in mindset. Products are typically optimized for user value, adoption, performance, and scale. Offices are defined by duty, mandate, procedure, and accountability. If ecosystems are represented principals, then the systems serving that representation cannot be evaluated only in market or product terms. They must be assessed in relation to the office they help instantiate: what claims they can carry, what duties they support, how they are reviewed, how they are challenged, and how they persist over time. This does not make commercialization impossible. It does mean that the governance core cannot be designed as if it were merely another software layer competing for attention.

The ninth implication is strategic: **pilots must be judged by their contribution to representational standing, not only by engagement or technical success.** A pilot may succeed in attracting users, generating compelling outputs, improving awareness, or demonstrating novel interaction patterns. These are meaningful achievements. But if the pilot leaves ecosystems in the same procedural position as before—visible, perhaps admired, but still optional—then it has not crossed the threshold this paper identifies. The more relevant pilot questions become: *Did ecological claims gain a trigger in review pathways? Were duties clarified? Was dissent preserved? Did any institution become newly obliged to respond? Did the system alter the burden of justification even slightly?* If not, the pilot remains largely symbolic, however elegant its design.

The tenth implication is cautionary: **automation should follow representation, not replace it.** This paper does not argue for handing ecological judgment over to machines. On the contrary, the whole argument depends on keeping legitimacy located in a bounded representational regime involving duties, institutions, benches, review, and public reason. Automation becomes appropriate only after the representational order is defined and only to the extent that it strengthens rather than displaces that order. Automating an illegitimate structure does not solve its legitimacy problem. It accelerates it. This is why representation before automation is not merely a slogan. It is a design principle. One must know what is being represented, by whom, under what duties, and with what consequences before deciding what parts of the process can be responsibly automated.

Taken together, these implications define a stricter standard for Environmental AI than is commonly applied. They suggest that the field should be divided less by technical modality than by constitutional role. Some systems will remain symbolic by design: educational, communicative, awareness-raising, culturally important. Others may become structural: tied to standing, review, and accountability. Both have value, but their value is different, and confusing the two produces the failures identified in this paper. *A symbol cannot be judged by the standards of an office. An office cannot be excused by the standards of a symbol.* The maturation of Environmental AI depends on keeping that distinction clear.

The broad implication can therefore be stated simply. Environmental AI matters only when it is embedded in a legitimate representational order. Outside such an order, it may increase visibility, improve analysis, deepen empathy, and support stewardship. But it does not yet make ecosystems count where power is exercised. Inside such an order, however, AI may become

one of the key infrastructures through which ecological principalhood is carried across complexity, fragmentation, and time.

That conclusion returns us to the central claim of the paper. The unresolved bottleneck is not expressiveness, intelligence, or even authority in the abstract. It is representation.

Environmental AI will remain politically thin unless ecosystems become represented principals with standing, duties owed, reviewable claims, and public justifications that institutions cannot ignore without consequence. The conclusion gathers that argument in final form.

### Key Implications Summarised:

	IMPLICATION	TYPE
1	Environmental AI is not itself a source of legitimacy.	CONCEPTUAL
2	Most current Environmental AI remains pre-constitutional.	HISTORICAL
3	Environmental AI must be designed backward from consequence.	ARCHITECTURAL
4	Environmental AI should not be built as one generic intelligence layer speaking in one synthesized voice.	RELATIONAL
5	Environmental AI must be built for audit, not just output.	PROCEDURAL
6	Environmental AI must be designed as continuity infrastructure rather than episodic assistance.	TEMPORAL
7	Legitimate Environmental AI should make mediation more inspectable, not less.	CATEGORISATIONAL
8	Environmental AI should be treated less like a product and more like an office-bearing infrastructure.	ORGANIZATIONAL
9	Pilots must be judged by their contribution to representational standing, not only by engagement or technical success.	STRATEGIC
10	Automation should follow representation, not replace it.	CAUTIONARY

The argument of this paper has been straightforward in structure, even if demanding in implication. Environmental AI has made ecosystems more visible, more legible, more speakable, and in some cases more institutionally present than before. But visibility is not standing, and voice is not yet representation. Modern governance can absorb ecological intelligence, ecological symbolism, ecological participation, and even ecological warning without changing the deeper terms under which decisions become legitimate. The central unresolved problem is therefore not whether ecosystems can be modeled, narrated, or heard. It is whether they can become institutionally present as principals with claims that bind.

That problem is constitutional because it concerns the architecture of legitimacy itself. Modern institutions remain grammatically anthropocentric: they are built to recognize human persons, human interests, human time horizons, and human forms of claim-making. In such a system, ecosystems usually appear as managed objects, protected assets, stakeholder concerns, or moral symbols. They do not readily appear as entities to whom duties are owed. This is why ecological harm can be measured, mourned, and publicly acknowledged while remaining procedurally negotiable. And it is why Environmental AI, however sophisticated, risks becoming a high-resolution instrument of symbolic governance unless it is embedded within a stronger representational order.

The paper's central claim has been that ecological legitimacy requires a move beyond stakeholder logic toward ecosystems as represented principals. Stakeholders can be heard without changing what institutions are allowed to sacrifice. Principals reorder the burden of justification. Once ecosystems are treated as represented principals, ecological integrity is no longer merely a factor to be weighed among competing preferences. It becomes something owed protection, something that can trigger duty, review, contestation, and public explanation. This does not eliminate politics. It changes the constitutional field within which politics remains legitimate.

From that shift follow the conditions of legitimate ecosystem representation: standing, duty, review, contestability, evidentiary plurality, public reason, and continuity across time. No single one is sufficient. Together they form the minimum grammar of non-symbolic ecological representation. They do not resolve the proxy problem by discovering a pure spokesperson for nature. They address it procedurally, by designing a representational regime in which ecological claims can be formed, tested, challenged, revised, and carried into institutions

without being reducible to sentiment, expertise, or convenience alone. Legitimacy arises not from perfect authenticity, but from accountable mediation.

*This is why the question "who speaks for nature?" ultimately receives an architectural rather than a personal answer. Not one guardian. Not one expert. Not one community. Not one model. Not one AI. Legitimate ecological representation requires a distributed structure of bounded offices—guardians, benches, review mechanisms, assemblies, public records, and continuity functions—through which ecological claims become institutionally serious. In that structure, the Scientist, Anthropologist, and Advocate are not merely interpretive voices. They are differentiated benches of authority carrying ecological validity, situated meaning, and normative duty into a common field of judgment.*

Once this is accepted, ecological democracy comes into view. Democracy is no longer adequately described as the aggregation and contestation of human claims alone. It must be reorganized around biospheric constraint: around the recognition that some ecological conditions are part of the legitimacy architecture of rule rather than external policy variables to be negotiated after the fact. **This is not less democracy. It is democracy subjected to the reality of its own material dependence.** A polity that may endlessly consult ecosystems while continuing to authorize their degradation has not solved the ecological question by widening participation. It has only become more articulate in its evasion. Ecological democracy begins when ecosystems are no longer merely around the table as concerns, but effectively situated at the table as represented principals.

The implications for Environmental AI are therefore both narrowing and enlarging. Narrowing, because AI is stripped of easy claims to legitimacy by performance alone. It does not become politically meaningful because it is accurate, persuasive, engaging, or emotionally resonant. Enlarging, because once embedded within a legitimate representational order, it may help carry ecological standing across complexity, fragmentation, and time. It may preserve continuity, structure memory, surface thresholds, support differentiated benches, record dissent, and make ecological claims harder to neutralize silently. But all of that is downstream from the primary question. Representation comes before automation. Without a legitimate representational regime, Environmental AI remains politically thin. With one, it may become part of the constitutional infrastructure through which ecosystems acquire **real standing inside governance.**

The deeper ambition of this paper has not been to offer a finished model of ecological governance, still less to suggest that the representational problem is solved once named. The

problem remains difficult, contested, and unfinished. Representation will remain vulnerable to distortion. Institutions will resist reordering their own legitimacy conditions. Publics will disagree about thresholds, duties, proxies, and priorities. None of that is a reason to retreat. It is a reason to proceed with constitutional seriousness rather than symbolic comfort. The choice is no longer between perfect representation and none at all. The real choice is between institutions that continue to govern as though ecological dependence were politically optional, and institutions that begin to treat the living world as something to which they must answer.

That is the threshold this paper has tried to mark.

Environmental AI has already shown that ecosystems can be made visible. From *Symbolism to Authority* showed that visibility alone is not enough, and that ecological claims become consequential only when they enter the authorization layer of governance with review, traceability, and procedural force. The present paper has argued that the missing bridge between those insights is representation: legitimate, procedural, reviewable, more-than-human representation. Without it, ecosystems remain eloquent but optional. With it, they begin to acquire a place within governance not as symbols of care, but as presences that alter what governance is allowed to do.

The next question, then, is no longer primarily political. It is technical in a constitutional sense. If ecosystems are to be represented legitimately through Environmental AI, how must such systems actually be built? How can differentiated authority survive implementation rather than collapsing into a single hidden epistemology beneath multiple interfaces? *That is the question of retrieval, synthesis, and machine architecture. It is the problem of how representation becomes computationally real.*

That is the task of the next paper.

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# ABOUT THE AUTHOR

Milan Meyberg is a sustainability strategist, systems designer, and co-founder of Emissary of GAIA—an Eco-Tech startup exploring the interface between artificial intelligence, environmental law, planetary regeneration, and governance. His work bridges scientific systems thinking, rights-based legal innovation, ecological intelligence, and narrative design to help usher in a new epoch of multispecies co-agency: The Symbiocene.

As the conceptual architect of the Environmental Artificial Intelligence (ENVAI) framework and the Symbiocene Transition Ladder, Milan has pioneered methodologies for embedding AI within ethical, ecological, and civic reasoning architectures. His proposals on Symbiocentric Intelligence—AI designed not for dominance or prediction but for participation and legitimacy—are helping shape new conversations around AI governance, Earth jurisprudence, and regenerative civilization.

Milan has presented his work at high-impact forums such as the World Economic Forum (Davos), TEDx MIT (Planetary Stewardship edition), Boom Festival, Love Tomorrow Conference, and various EU/UN policy dialogues on Rights of Nature.

He collaborates with institutions including the Technical University Delft, the University of Amsterdam, and the Brightlands Circular Space, and works closely with movements advocating for the Rights of Nature, Earth Democracy, and Posthuman Governance. His practice is shaped by lived experience in both grassroots ecological activism and systems-level innovation—and grounded in the belief that intelligence, like life, must be relational, reflexive, and reparative.

If you'd like to respond to this paper, explore collaboration, or discuss a pilot, keynote, or workshop, you can reach Milan via:

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## About Emissary of GAIA

Emissary of GAIA is building Environmental AI (ENVAI): place-anchored ecosystem avatars that translate scientific signals, cultural meaning, and legal responsibilities into forms institutions and communities can engage with. Each avatar is designed to support real-world governance—helping decision-makers reason with ecological constraints, articulate public legitimacy, and sustain responsibility across time. The initiative draws on advances in AI, Earth observation, environmental law, and civic process design to develop systems that do not merely “analyze nature,” but represent living systems as principals with enforceable interests. Its central question is simple: *what would it mean—procedurally, legally, and culturally—for ecosystems to have a credible voice in the rooms where futures are decided?*



*For my daughter Ysa*

—  
whose arrival transformed distant futures into living, breathing immediacy.

May you inherit a world where rivers speak, forests endure,  
and human brilliance expresses itself as care rather than conquest.

You are the reason this work reaches beyond the present,  
toward a Symbiocene yet to emerge.

May the systems we build today  
co-create the world you inherit tomorrow.