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From Map Follower to Navigator: Archetypes of Environmental Impact Assessment

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ABSTRACT

Environmental impact assessment (EIA) scholarship is commonly framed as a tension between efficiency and comprehensiveness paradigms. These paradigms describe a persistent tension but cannot explain how EIA operates through it. Drawing on social systems theory, this analysis traces that operation. A hypothetical tidal power EIA anchors the thought experiment. Three archetypal lenses guide the analysis: map follower, explorer and navigator. The map follower, efficiency-leaning, follows predetermined routes. The explorer, comprehensiveness-leaning, ventures into unmapped territory. The navigator finds paths through contradictions. Each lens foregrounds distinct problem-solution dynamics that organise EIA's operations. The article therefore asks: How do these recurring dynamics sustain EIA over time? Conventional EIA scholarship often treats problems as obstacles to be overcome. This article reverses the framing: Problems are not overcome but recognised as conditions of operation. Each archetype's seasoned form renders its characteristic problem a working resource that sustains EIA's decision capacity over time.

1 | Introducing the Three Archetypes

Environmental impact assessment (EIA) is a communication system. It enables regulators, developers, scientists and communities to reach decisions about a project's likely environmental consequences. However, this system confronts recurring problems: fragmented communication across different systems, stakeholder deadlock and the impossibility of assessing everything. Scholarship and practice often treat these as obstacles to be overcome. Remove them, the reasoning goes, and assessment should function properly. The contrast can be drawn sharply. Read as obstacles, the problems appear as removable failures of the EIA system. Read as enabling conditions, they appear as structural features that sustain the EIA system's capacity to reach and legitimise decisions. This article adopts the second reading. Operating in this enabling capacity, each recurring problem generates a corresponding solution. Each solution works provisionally, stabilising institutional arrangements until it no longer fits the conditions it helped create. To make this dynamic visible, consider three archetypal positions—map follower, explorer and navigator. A hypothetical tidal power assessment illustrates how each renders different problems visible.[1]

Applied to this tidal assessment, each frames a different problem and generates a different stabilising response. The map follower follows predetermined survey routes, measuring water flows and counting fish species. This is an efficiency orientation. Its standardised outputs potentially satisfy procedural requirements but may not register across scientific or political forums. These gaps—connectivity deficits—are the map follower's defining problem. The seasoned map follower addresses these deficits through scientific discipline: peer-reviewed methods compelling engagement across law, economics and politics. Across all three archetypes, the conventional stance treats each problem as a given obstacle. The seasoned stance recognises how problems and responses continuously reshape one another.

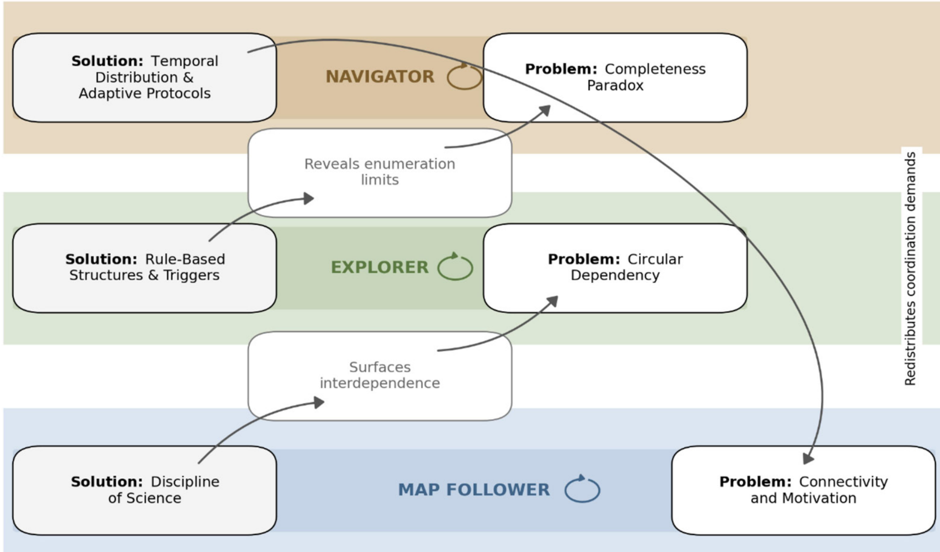

FIGURE 1 | The recursive cycle of EIA problem-solution dynamics: from map follower to navigator. [Colour figure can be viewed at wileyonlinelibrary.com]

The remaining two archetypes confront different dynamics. The explorer charts unmapped territory, interviewing stakeholders and modelling cascading ecological effects. Circular dependency—mutual decision interdependence—intensifies into gridlock when comprehensive orientation multiplies the decisions requiring alignment.[2] The seasoned explorer breaks this gridlock through rule-based protocols: fixed decision triggers enabling coordination without prior consensus. The navigator finds paths through contradictions, balancing political pressures against scientific uncertainties. The completeness paradox—each assessment revealing further incompleteness—is the navigator's defining problem. The seasoned navigator manages this paradox through temporal distribution. Decisions are phased across time so that comprehensive knowledge is never required at once. These three observational positions, and the solutions each cultivates, set the stage for the analysis that follows.

The institutional setting of environmental assessment is well established. EIA functions as a decision-support tool separating technical analysis from political choice (Morgan 2012). It operates as a coordination system linking law, science, politics and economics. Its procedures engage multiple stakeholders and require anticipatory scope across complex systems (Therivel and Wood 2018). These institutional features structure precisely the recurring problems the archetypes reveal. Confronted with such problems, practitioners and scholars naturally ask how to fix them. Adaptive management and learning-based approaches often treat EIA as a broadly transferable technique, addressing these through iterative cycles (Noble 2000; Morrison-Saunders and Arts 2004; Bond et al. 2018). This article takes a prior step. It asks not how to improve outcomes, but what sustains the EIA system through its daily problems. Establishing the problem is the analytical move that improvement-led approaches skip. This improvement-first stance asks 'what to do' before clarifying what is at stake; the observational stance reverses the order. Observing from a distance makes the EIA system's recurring problems visible as effects of its own organisation. This sharpens the insight that any later judgement of improvement requires.

The article therefore asks: How do recurring problem–solution dynamics sustain the EIA system's operations? What becomes visible when these dynamics are traced through distinct observational positions? By observational positions, this article means the three archetypes introduced above—map follower, explorer and navigator. Each is a distinct way of seeing the EIA process. Each determines what becomes visible as a problem and what appears as a solution. Within each archetype, an internal shift runs from conventional to seasoned. Between archetypes, the recursive cycle operates at a different level. Each seasoned solution, rather than eliminating its defining problem, displaces it into the next position's terrain. Scientific discipline builds credibility that intensifies circular dependency. Rule-based protocols stabilise decisions but narrow relevance, exposing the completeness paradox. Problems are not left behind. They are respecified through the solutions addressing them. Figure 1 illustrates this recursive cycle as a heuristic for observation, not a step-by-step guide for practice.

This respecification, traced through the archetypes, reveals what paradigm contrast alone cannot. The efficiency and comprehensiveness paradigms describe a persistent deadlock but cannot explain how the EIA system operates through it. Drawing upon social systems theory (Luhmann 1995b; Knudsen 2011), the analysis gives contours to the three archetypes. These archetypes therefore form a conceptual interpretation, not a definitional claim about EIA's structure. Each archetype exposes what slips past the paradigms' own logic. The paradigms can name the efficiency–comprehensiveness opposition but not how each side keeps generating the other. The archetypes make visible how the EIA system continues operating through these tensions. The archetypes are observational positions, not personality types or fixed stages.

As observational positions rather than personality types or fixed stages, the archetypes call for a method suited to recurring patterns. The full recursive cycle (Figure 1) is rarely observable in any single empirical case because EIA processes are messy and stretched across long timeframes. The research question therefore concerns structural patterns that cut across cases rather than features of any single one. The analysis applies each position to a hypothetical tidal power EIA as a thought experiment (Aguinis et al. 2023). The aim is diagnostic-heuristic: a structured way of seeing recurring patterns, not an empirical claim about any one project. What the thought experiment engages is therefore partly shaped by the observational position adopted. The constructivist lens underpinning this analysis is developed in Section 3.

The article proceeds in three movements. The first establishes the terrain: the entrenched efficiency versus comprehensiveness debate and the constructivist lens that reframes it (Sections 2–3). The second traces each archetype's problem–solution dynamics through the hypothetical tidal assessment (Sections 4–9). Viewed from the seasoned archetype lens, connectivity deficits, circular dependency and the completeness paradox sustain EIA's decision capacity. Each becomes a productive resource over time. The third draws out what the analysis contributes and where its analytic reach most clearly applies (Discussion and Conclusion).

2 | Efficiency Versus Comprehensiveness

Consider a large-scale tidal power project facing environmental assessment requirements. Environmental impact assessment embodies contested definitions across professional and academic communities. Despite definitional debates, the International Association for Impact Assessment (IAIA) provides a foundation. IAIA (1999) frames EIA as systematically identifying, predicting, evaluating and mitigating environmental impacts. This anticipatory process originated with the US National Environmental Policy Act in 1969. The Rio Declaration 1992 catalysed global adoption across diverse jurisdictions (UN 1992). Currently, over 100 countries integrate EIA into development planning processes (Gaylard et al. 2025). Morgan (2012; see also Jay et al. 2007) establishes EIA as a decision-support tool that systematically assesses potential environmental consequences before decisions are finalised. In principle, it provides independent technical information to decision-makers within a framework that maintains a clear separation between technical analysis and final political choices. Inevitably, pursuing this core function generates fundamental debate. This disagreement reflects a deeper tension between two competing priorities: streamlined decision-making and thorough risk assessment.

The efficiency paradigm frames EIA as an administrative procedure requiring systematic optimisation. The map follower archetype illustrates this logic, navigating regulatory pathways with a focus on streamlining. This approach centres on reducing transaction costs and enhancing investment certainty. Bond et al. (2014) identify streamlining as a legitimate performance enhancement strategy, manifested in legislative reforms such as fast-tracking, parallel processing and mandatory time limits. These mechanisms address regulatory timelines perceived as 'constraints' on economic development. UK regulatory reforms exemplify this global efficiency drive, reducing assessment timeframes (Defra 2025). Morgan (2012) documents widespread adoption of procedural acceleration measures internationally. Infrastructure priorities often justify streamlined reviews for strategic projects. Cost–benefit analysis often favours deliverability, particularly for strategic infrastructure. This can position comprehensive analysis as secondary for impacts that are difficult to quantify in monetary terms. Economic rationality often governs assessment agendas, prioritising streamlining over exhaustive evaluations.

In contrast to administrative optimisation, the comprehensiveness paradigm frames EIA through the precautionary principle. The principle requires active preventive effort: Uncertainty cannot be used as an excuse for inaction (UN 1992, Principle 15). The Aarhus Convention (UNECE 1998) exemplifies this obligation through three institutionalised requirements: information, participation and justice. The explorer archetype embodies this procedural logic, venturing beyond established boundaries to identify unknown risks and cumulative impacts. Bond and Pope (2012) reinforce this focus, distinguishing substantive from procedural effectiveness and prioritising actual environmental outcomes. Morrison-Saunders and Arts (2004) position public participation as an essential knowledge source, where community understanding complements technical analysis. The Biodiversity Beyond National Jurisdiction Agreement (UN 2023) exemplifies this paradigm's contemporary expression. It embeds precautionary EIA triggers for activities in areas beyond national jurisdiction (Gullett and Craik 2025). It also institutionalises the inclusion of Indigenous and local traditional knowledge alongside scientific expertise (Rometius and Wang 2025). Thoroughness defines this approach through expanded analytical depth and breadth (Cashmore et al. 2004).

Both paradigms share an essentialist outlook despite their apparent operational opposition (Luhmann 1990a). Each follows the formula 'in spite of X, we think Y.' The efficiency paradigm operates through economic rationality imposing market logic. Despite incomplete data, it proceeds prioritising streamlining and cost. Embedded here is the expectation that technical fixes can bracket systemic uncertainty through optimisation. The comprehensiveness paradigm operates through scientific rationality imposing analytical exhaustiveness. Despite 'urgent' development needs, it prioritises thoroughness. Embedded too is the expectation that more information produces decision-readiness under complexity. However, comprehensive data often generates new uncertainties: Too many cogs make each cog less visible (Luhmann 1990b). The tension between these opposed rationalities thus proves fundamental to EIA practice. Each paradigm's solution logic generates conditions the other identifies as problematic. Efficiency's streamlined timelines intensify uncertainty about overlooked impacts. Comprehensiveness's expanded scope creates demands for procedural acceleration.

From these dynamics, a recursive relationship emerges: Problems and solutions continuously reproduce each other. Because this cycle is self-reinforcing, the underlying tension is permanent. The paradigms supply rival criteria for correct assessment—streamlining versus thoroughness.[3] The archetypes—map follower, explorer and navigator—supply observational lenses for the recursive movement between them. Each archetype's solution produces the conditions for the next's defining problem. Each reveals what its observational position makes visible—and what it necessarily leaves unseen.

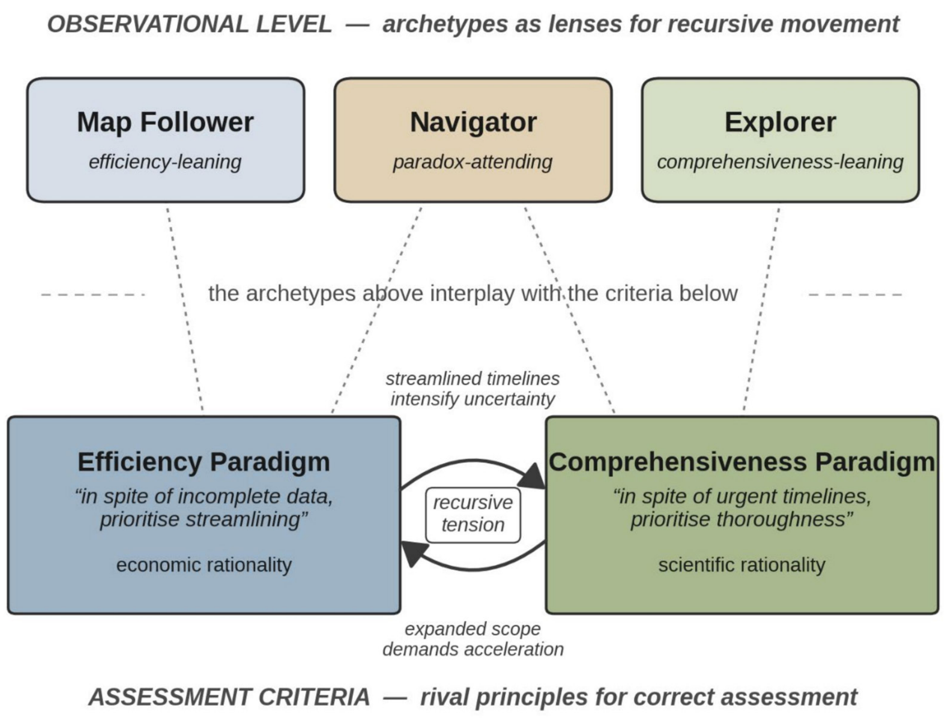

FIGURE 2 | Two levels of analysis: paradigms and archetypes. [Colour figure can be viewed at wileyonlinelibrary.com]

Tracing recursive movement gives the archetype framework its diagnostic capacity. It complements existing approaches rather than replacing them. Adaptive management and learning-based approaches have demonstrated the value of iterative assessment. Their logic is improvement-oriented: How can EIA outcomes be made better? The archetype framework asks a different question. It asks how the EIA system keeps operating—including through the very tensions improvement seeks to resolve. Understanding EIA's complexity means taking both questions seriously. Figure 2 distinguishes the two levels at which this complexity is observed—paradigms and archetypes. The next section develops the analytical tools for tracing these dynamics.

3 | Constructivist Lens and Method

Drawing on social systems theory (Luhmann 1995b; Knudsen 2011), this article examines recursive relations between EIA problems and solutions. These relations constitute the analytical lens defining the three archetypes. Solutions do not automatically respond to problems. Problem definitions and solutions refine each other recursively (Luhmann 1988; Knudsen 2011). A problem's definition refines the solution, which in turn clarifies new problem boundaries. Each archetype's solution logic shapes what becomes problematic. Shifting to this level of observation requires bracketing certain prior questions. This lens temporarily suspends the 'What should we do?' question to observe how the EIA system keeps operating. Adaptive management and learning-based approaches ask how EIA outcomes can be improved. Both questions are legitimate; this article pursues a more foundational question: What sustains decision-making capacity through persistent tension? Given the complexity of social systems theory, a full explanation lies beyond this article's scope. The analysis simplifies concept names for accessibility while preserving the underlying logic.[4] These adapted concepts share a single premise: How observation is structured determines which problems become visible. This section builds that principle into a framework of observational positions, diagnostic distinctions and method.

Recursive problem–solution analysis treats problems as observation-dependent. The three archetypes therefore function as observational positions, not personality types, institutional roles or normative prescriptions. They are structured ways of distinguishing between the EIA system and its operating environment. Each position operates through a guiding distinction—a lens that reveals some dynamics and hides others.[5] Shifting from one distinction to another changes what the same assessment reveals. The map follower observes through connectivity/autonomy—linking decisions to other processes or protecting the procedural space of scientific inquiry. The explorer observes through inclusion/exclusion—which voices, data and effects enter the assessment frame. The navigator observes through completeness/incompleteness—how current decisions relate to the open horizon of future knowledge. These are observer-made differences, not intrinsic properties of the assessment process (Luhmann 2006b). Any practitioner or institutional configuration can occupy any position at a given moment (Checkland 2000).

Distinguishing observational positions from the efficiency and comprehensiveness paradigms clarifies what the archetypes add. Paradigms offer competing criteria for correct assessment. Archetypes are observational positions determining which criteria become salient. The map follower has an affinity—not an identity—with efficiency, loosely aligned with an investor's orientation towards predictability. The explorer's affinity with comprehensiveness resonates with an ecologist's sensitivity to cascading effects. The navigator has affinities with both paradigms at once, like an EIA project manager exposed to the sequencing of both. It observes paradox as the operational effect of moving between paradigms in sequence. This dual exposure—holding both paradigms in view rather than treating either as a separate stance—opens its analytical angle. The navigator's position reveals what the paradigm debate alone cannot. It shows how the system moves between positions, managing tension rather than resolving it.

What distinguishes archetypes is not only which position is held but how its limits are recognised. Adapting Fuchs's (2005) interpretation of Luhmann's observational orders (Luhmann 1995b; Moeller 2017), the analysis introduces conventional and seasoned dynamics within each position. Conventional archetypes attribute problems to the situation itself. Complexity appears as an external obstacle—insufficient data, resistant stakeholders or regulatory delay. Because the mode of observation is rarely brought into view, problems appear operationally stabilised and solutions self-evident. Seasoned archetypes add reflexive awareness. Attention shifts from what appears problematic in the situation to how it is being observed. Problems become diagnostic indicators of how the assessment is organised. What appeared as external constraint is reread as an effect of observational structure. Credible interfaces, decision triggers and temporal distribution are not general improvements. They are responses to recognising that no single decision can absorb all relevant complexity. Seasoned observation is differently situated, not epistemically superior. It reveals dependencies invisible from the conventional stance while generating blind spots of its own. The binary distinction between acceptable and unacceptable impacts is one among these blind spots. The seasoned archetype is aware of the distinction and of the risk of pressing it too far. That risk is unlimited critique—the questioning of why an EIA system should exist at all. This is the risk seasoned observation declines to take.

At the level of positions, the analytic lens is non-normative. Each archetype has blind spots, and each is necessary within the recurring cycle illustrated earlier. No position is superior. At the level of awareness, the analytic lens is diagnostically normative. It values reflexive understanding—operationalised through the seasoned form of each archetype—over unreflective embeddedness.[6] The aim is not to prefer one archetype over another. It is to recognise, as seasoned observation does, what each position makes visible and what it filters out. This diagnostic orientation requires a method suited to recurring patterns.

Tracing such patterns also requires acknowledging the limits of the archetype lens itself. These limits operate as three epistemic boundaries that define the scope of this archetype analysis. The archetype lens does not predict outcomes. It does not validate empirical claims. It does not claim exhaustive coverage. Each negation enables a recursive observation. Not predicting frees the lens to trace movement. Not validating frees it to compare responses. Not claiming completeness fixes the problem reference for comparison. These boundaries are constitutive commitments that let recurring problem–solution patterns become observable. By fixing the problem reference analytically, they make structurally different responses comparable across positions.

Behind these methodological commitments lies a deeper epistemological divide (Buchinger 2012; Berg-Sørensen et al. 2010). Essentialists pursue: 'How to achieve Y despite X?' Constructivists observe, treating problems as effects of organisation: 'Because of condition X, the system observes Y' (Luhmann 2006a; Kaczmarczyk 2025). X here is structural (how the assessment is organised); Y is the problem that becomes observable under those conditions. This constructivist stance makes recurring patterns visible as diagnostic indicators of how assessment is organised. Each archetype's defining questions function as diagnostic windows. Recurring concerns about data correctness, gridlock or completeness reveal the guiding distinction each position employs. Conventional and seasoned forms use the same distinction differently. One applies it within established routines; the other with explicit awareness of its selectivity. Reflexive use of each distinction generates a characteristic way of constructing problems. This diagnostic capacity—visible through characteristic questions—is what paradigm analysis alone cannot provide. Figure 3 summarises these diagnostic windows; the following sections explore them in detail.

4 | Map Follower Problem: Motivation and Connectivity

The map follower prioritises legal compliance to avoid uncertainties that deeper ecological inquiry would introduce. Environmental assessment becomes a procedural exercise in regulatory compliance and risk containment. For the map follower, science is trusted only once stabilised into enforceable legal thresholds and standards. Scientific findings not yet stabilised into thresholds carry uncertainty that threatens procedural certainty. The tidal barrage assessment illustrates this orientation, where public consultation becomes a procedural exercise defined by regulatory deadlines. The map follower primarily orients around procedural non-compliance that could enable judicial review, not the substantive ecological disruption itself. The fear of review drives a calculated approach treating the EIA as legal insurance against future challenges. The legal-insurance logic shapes documents for courtroom survival, like surveyors establishing defensible boundaries. Science serves as raw material for regulatory crystallisation and legal validation (Buitendag 2025). The compliance orientation narrows the assessment's purpose to administrative closure through technical compliance. Once reduced to thresholds, scientific findings no longer travel easily into political deliberation or public argument.

Simultaneously, the legalistic focus generates motivation problems by creating selective pressures on information presentation (Luhmann 1995b). Motivation is the underlying factor shaping how information gains acceptance across different social systems. Economic systems demand commercially predictable conclusions; political systems require adaptable strategic narratives. This external pressure drives motivated selection, where uncertainty is filtered to protect commercial predictability. The hypothetical tidal assessment illustrates this mechanism through its turbine choice. Bulb turbines are selected over Oscillating Water Columns. This selection prioritises proven performance and financial predictability. The

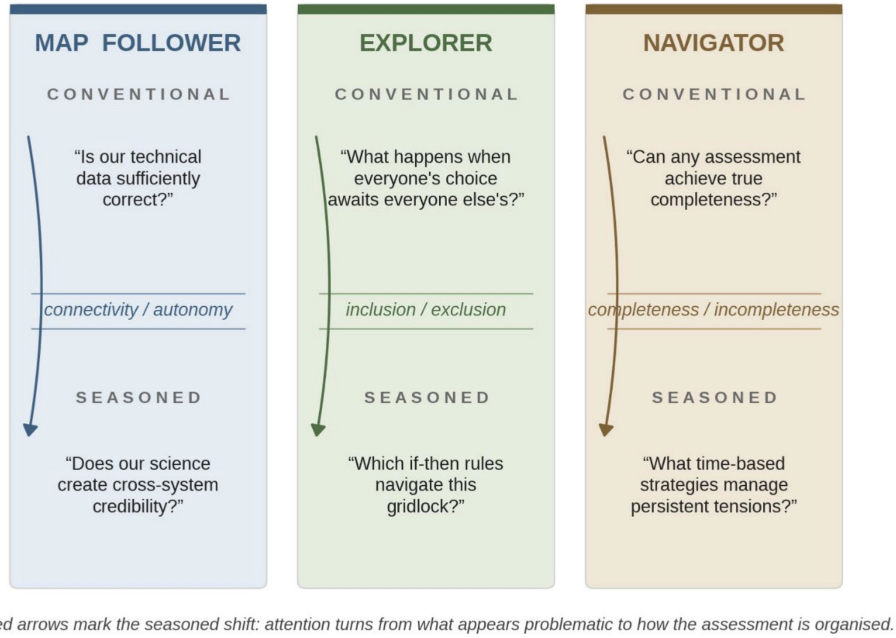

FIGURE 3 | From conventional to seasoned: diagnostic questions across three archetypes. [Colour figure can be viewed at wileyonlinelibrary.com]

map follower builds this into a broader pattern: Information irreconcilable with existing legal thresholds is excluded or down-weighted. Filtering of this kind delivers economic acceptability, anchored in investor risk-committee approval. Economic decision-making accepts what remains as relevant and adequate; ecological inquiry discounts it as insufficient. Economic uptake depends on the very omissions that ecological inquiry would foreground. The EIA thus transforms into a legitimising ritual for predetermined outcomes rather than a rigorous environmental review (Bond et al. 2020; Morrison-Saunders et al. 2015; Pope et al. 2013). Economic acceptance is purchased through scientific discrediting, a trade whose broader implications the next move unfolds.

Beyond motivation lies connectivity: the assessment's ability to link up with other systems, such as science, politics and law (Leydesdorff 2000; Roth and Schütz 2015; Roth et al. 2024). The map follower confronts a blank spaces dilemma where formal EIA completion requires strategic uncertainty omission. Like early mapmakers leaving unexplored territories blank, apparent completeness emerges through calculated incompleteness. This frozen snapshot satisfies administrative requirements but cannot evolve with temporal demands. Political systems require narratives adapting to electoral pressures and shifting public priorities. However, preferences for bulb turbines, once codified in standards, restrict alternative technology adoption. As regulatory compliance crystallises these technological choices, scope for political and economic adaptation diminishes. Scientific connectivity weakens when assessments lack the uncertainties that stimulate research. Knowledge advances through questions and problems, not settled conclusions and solutions (Roth et al. 2024). The completed map is structured in ways that inhibit further inquiry or methodological innovation. The map follower delivers administrative certainty at the cost of adaptability and cross-system engagement.

5 | Seasoned Map Follower Solution: Scientific Discipline

Unlike the conventional map follower, this seasoned actor strategically deploys science to facilitate cross-system communication (Hernes and Bakken 2003). Different systems—law, economics and politics—process information in distinct ways, creating communication barriers (Vanderstraeten 2000; Roth and Schütz 2015). The seasoned map follower addresses this through calculated use of formal methods and peer review. Scientific methods translate raw observations into standardised formats such as water turbidity thresholds and decibel limits for noise. Once formatted this way, other systems respond to the verified method rather than to the practitioner. This is method-based authority, not personal credibility. Because authority rests in the method, the findings carry force across system boundaries. Peer-reviewed findings compel legal engagement; certified environmental risks enter investor calculations. Political systems assess the same metric for electoral implications.

Facing temporal contingency, the seasoned map follower deploys scientific programmes that address both complexity and future uncertainty. Two kinds of uncertainty shape this response. Complexity arises from interdependent variables such as sediment flows, ecological impacts and turbine performance. Contingency involves unpredictable future events, including shifting regulatory standards and evolving public priorities. Scientific discipline structures uncertainty through threshold-based protocols that predefine responses to observable conditions (Valentinov 2014). For instance, sediment accumulation exceeding projected levels triggers reassessment protocols. Each monitoring phase produces partial findings that identify gaps, which then structure subsequent investigation. This method designs EIA as a learning system (Noble 2000). It uses each phase to integrate new data, steadily refining decisions instead of cementing them from the start. Phased assessment programmes provide the structural framework for this learning system. These programmes break down uncertain futures into discrete segments, creating a structure. This allows the EIA system to adapt as new information emerges. Decisions are framed as provisional and methodologically justified. This enables adaptive steering rather than rigid, arbitrary commitments.

By organising uncertainty into phased decisions, the seasoned map follower creates engagement points. These scheduled moments allow other systems—law, economics and politics—to coordinate their responses. The seasoned map follower recognises that the discipline of science translates complex environmental realities. It produces standardised formats that other specialised systems can process (Luhmann 1992; Roth and Schütz 2015; Kim 2025). A metric like water turbidity, for instance, is a carefully crafted simplification. Legal systems use it to judge compliance, while economic systems calculate risk. Political systems gauge public concern—each interpreting the same metric through distinct logics. Furthermore, this scientific discipline creates a predictable schedule for interaction. Quarterly monitoring reports and annual reviews become anticipated engagement points. These allow different systems to coordinate responses around a common timeline without being overwhelmed by underlying complexity.

Scientific discipline creates predictable engagement points. The seasoned map follower also deploys it to resist external interference. They anchor decisions in scientific method requirements, resisting political or economic pressures for predetermined outcomes. Because the method itself mandates each step, invoking it allows the seasoned map follower to resist pressure for foregone conclusions. The method supplies the defence; the seasoned map follower invokes it against pressure for fixed findings. Yet this credibility carries an inherent feature: It depends on revisability. Science operates as a self-observing system that continuously revises its knowledge structures (Roth et al. 2024). This ongoing reflexivity sustains internal credibility. Today's validated tidal baseline, impact predictions and compliance thresholds cannot be treated as fixed. Each participant—developer, regulator and community—must anticipate how others might respond to possible future revisions. This mutual anticipation is circular dependency—present wherever actors coordinate. What makes it the explorer's defining problem is the subject to which we now turn.

6 | Explorer Problem: Circular Dependency

The explorer sets out to map the tidal project zone to satisfy comprehensive assessment requirements. However, thoroughness breeds its own intractable problem: circular dependency. This condition is general—it emerges in any setting where actors depend on one another's choices. Yet the explorer's comprehensive scope widens the circle of actors whose choices interlock. What remains manageable elsewhere escalates here into the explorer's defining problem. Comprehensive mapping produces a structural condition in which every finding depends on assumptions held elsewhere. Mutually opaque positions lock participants into anticipation they cannot resolve (Roth et al. 2024). The explorer's extensive mapping has revealed a self-reinforcing cycle of contingent decisions. Under comprehensive mapping, this cycle escalates into coordination strain.

Incompatible systemic logics turn circular dependency into decisional complexity (Luhmann 1995b; Roth et al. 2025). The assessment stalls because systems cannot find consistent ways to align decision-making. Consider a model projecting increased flood risk where tidal flows would change. For the developer, this is a mitigation expense calculated in millions. For the regulator, this is a legal threshold that determines project approval. For riverside communities, this is an existential threat to their homes. These are not disagreements but incommensurable decision logics. The developer speaks in cost–benefit ratios and insurance models. The regulator speaks in compliance standards and statutory obligations. Communities speak in safety and survival. Present flood risk as manageable cost, and communities rebel. Frame flood risk as legal violation, and developers dispute the interpretation. Describe it as acceptable impact, and regulators cite precautionary principles. Other findings reproduce the same impasse. An intertidal ecosystem dependent on the altered tidal cycles meets the same incompatible registers. Incompatible logics, accumulating through every attempted framing, leave the explorer paralysed.

The explorer's logical response to coordination difficulty is the required public consultation meeting, held in the expectation that transparency will forge consensus. Instead, the forum often reveals fundamental incompatibilities. Consider a scenario where the meeting screen displays three overlaid maps. Turbine placement optimised for tidal flows occupies prime shipping lanes, which also intersect harbour porpoise migration routes mapped by marine biologists. Port authorities simultaneously project vessel traffic separation schemes governing commercial navigation. This spatial overlay materialises the circular dependency: No actor can select a location without conflicting with another system's operational requirements. Each map represents a different system's operational requirements. The developer needs those specific locations for project economics. The maritime industry requires those waters for safe passage. Porpoises follow ancient pathways that predate human claims. The explorer is paralysed because any decision creates an irreconcilable conflict. The consultation generates more opposition with every suggested compromise. Being unable to decide becomes the only stable operation the process can maintain.

7 | Seasoned Explorer Solution: Rule-Based Protocols

Having faced paralysis, the seasoned explorer recognises how restrictive rules manage circular dependency. The boundary 'what is not permitted is forbidden' is a standing constraint, established before specific project proposals. This creates mutual predictability. Protected sites demonstrate this, where the precautionary principle is operationalised: Developers must affirmatively prove no adverse impacts (Jalava et al. 2013). This reverses the usual burden of proof, which typically rests on regulators to demonstrate harm. It creates a decisive gate. Developers and regulators both know this decisive gate. Neither needs to negotiate what constitutes permission. The boundary channels all decisions through binary assessment. Projects must meet the no-significant-harm threshold or face prohibition. This single reference point replaces uncertain mutual anticipation. The restrictive rule itself becomes the coordination mechanism. By establishing prohibition as the baseline, it aligns divergent actors. Circular dependency is mitigated through shared structural constraint.

Having seen how the restrictive rule structures decisions, the seasoned explorer understands why it remains stable. The rule functions by regulating disappointment through a shared anticipation of consequences (Luhmann 1995b). Multiple actors share expectations about violation processing. The same logic is visible at a legally designated conservation site. Legal designation converts uncertainty about permitted behaviour into shared anticipation of litigation. Developers expect litigation if they breach no-significant-harm thresholds. Regulators anticipate judicial scrutiny of their oversight. Environmental groups foresee legal remedies for violations. This shared anticipation creates a de facto rule-based protocol: If thresholds are breached, then legal consequences follow (Kanie et al. 2019; Grothe-Hammer and Berthod 2017). Because the legal system cannot prevent breaches, it instead guarantees that any breach becomes a communicative event. This makes collective foresight the operative source of stability, as present actions are disciplined by the certainty of future legal responses (Kang 2018). All actors know this in advance. Present decisions incorporate these future disappointment scenarios. The anticipation itself, not actual enforcement, maintains stability. This predictability in processing rule-breaking allows coordination despite potential disagreements.

The seasoned explorer recognises that restrictive and permissive logics are complementary. Restrictions establish red lines, while the principle 'what is not forbidden is permitted' creates operational space. Red lines provide stability: Communicated in general terms, they are rarely disputed. The challenge lies in the permissive space, where determining what is not forbidden becomes a continuous interpretive task. The Rochdale envelope embodies this principle in EIA practice (Caine 2018). It allows developers to propose parameter ranges (e.g., dimensions, locations) rather than fixed designs. Assessments must cover worst-case scenarios within those parameters. In doing so, the Rochdale envelope transforms uncertainty into manageable assessment tasks. These defined ranges become fixed parameters, enabling both developer flexibility and regulatory assessment of significant impacts. Through iterative dialogue, workable adaptations emerge and stabilise into predictable patterns. Long-term coordination becomes manageable despite uncertainty. The EIA system maintains its core purpose—assessing environmental risks—through structured adaptation within flexible yet bounded parameters.

The seasoned explorer understands how permissive frameworks create operational possibilities. Without them, unmanaged circular dependency would cause ongoing decisional deadlock. However, this approach legitimises specific consequences. The permitted scope of the EIA process can make certain alternatives less visible. Environmental options outside approved parameters become less likely to enter dialogue. Communicative focus remains on variations within the set boundaries. Additionally, the burden shifts onto prohibition advocates. Developer proposals have default permission within flexible EIA frameworks. Objectors must demonstrate violation of specific rules. Concerns lacking scientific evidence carry little weight in legal decision-making. Furthermore, reliance on flexible frameworks means reliance on project organisations, which inherently prioritise deliverable outcomes shaped by technological and capital constraints (Kang 2018). This flexible default persists only as long as social and political tolerance for its outcomes endures. The explorer realises that this very reliance creates the conditions for the navigator's paradox: Can flexible frameworks ever produce complete assessments?

8 | Navigator Problem: EIA Completeness Paradox

The navigator encounters competing framings that cannot be reconciled within existing decision expectations. Consider sediment flow assessments for the tidal project. Engineers treat optimal turbine efficiency at specific flow rates as the governing criterion. Marine ecologists treat the same flows as habitat disruption requiring protection. Both claims arrive with equal disciplinary standing. The navigator encounters them as competing operational demands, not as rival theories of fact. This is where decision strain concentrates. A regulator's demand for efficient, timely decisions meets a scientist's need for comprehensive, thorough analysis. The navigator experiences this as a dilemma requiring balance, sequencing or compromise. Streamlined, conclusive outputs must somehow accommodate thorough, multiperspective evaluation. The burden therefore falls to timing, justification and closure. Each option generates costs across the other dimension. The navigator encounters escalating demands without yet securing any point of coordination.

From this deadlock emerges the navigator's EIA completeness paradox. It takes the form 'A because not A' (Luhmann 1988, 1995a; Baraldi et al. 2021). Comprehensive assessment (A) inevitably proves its own incompleteness (not A). A seabed survey illustrates this operational reality. Any thorough mapping will discover previously unknown ecological niches. Such discovery demonstrates the inherent potential for incompleteness in any assessment. More investigation inevitably reveals more unknowns. The navigator reads this as a flaw and tries to solve it head-on, commissioning further surveys. Each survey opens new questions. Thoroughness, the conventional remedy, is precisely what reproduces the problem. The paradox makes complete knowledge structurally impossible to achieve. Every attempt at totality generates proof of partiality. This creates fundamental uncertainty at the assessment's core. The critical issue becomes paradox management, not resolution. Under pressure, the navigator keeps decisions moving by staging efficiency and comprehensiveness concerns sequentially. Each takes precedence at its appropriate moment. Because concerns are staged across time, the navigator settles into neither paradigm.[7] The navigator witnesses divergence empirically: Some assessments continue, others grind to a halt. Outcomes diverge from this point. Managed paradox enables functional operation despite assessment incompleteness. Unmanaged paradox produces immediate decisional paralysis.

The navigator witnesses two consequences of unmanaged paradox undermining operational capacity. Information overload occurs when the system is flooded with more observations than it can process (Shkliarevsky 2007; Roetzel 2019). Economic, ecological, legal and political communications may each generate cogent yet incompatible perspectives. Economic viability studies conflict with ecological impact assessments. No decision can satisfy all perspectives, creating decisional gridlock and a legitimacy crisis. Information deficit arises from built-in blind spots, which generate false certainty about assessment completeness. When exposed, these blind spots compromise the system's credibility. The hypothetical tidal project exemplifies both problematic states. Positive energy projections clash with negative habitat evaluations. Omitted lifecycle carbon assessments reveal critical blind spots. Trust is eroded from two opposing directions: information overload's paralysis or information deficit's deception. The navigator faces dual legitimacy challenges. These operational consequences demand sophisticated management responses beyond technical fixes.

9 | Seasoned Navigator Solution: EIA Paradox Management

Moving beyond the navigator's view, the seasoned navigator analyses temporal patterns. Their foundational operation involves drawing boundaries through scoping (Snell and Cowell 2006). By determining what counts as relevant, scoping counters the information deficit trap. The seasoned navigator employs goal-based frameworks targeting proportionate assessment—scope matching anticipated impact significance (Kanie et al. 2019; Rasche and Behnam 2009). This keeps future options open for learning and adaptation. Within this framework, rule-based protocols create specific obligations. Both inclusion and exclusion are legitimate procedural acts. For instance, cumulative impacts require receptor-specific criteria—mobile seabirds mandate vast zones while sedentary crabs justify localised assessment. Conversely, scoping out aviation reflects a proportionate focus on likely impacts: A tidal barrage has no plausible environmental or safety link to aviation operations. These protocols transform uncertainty into present obligations. The framework converts infinite complexity into justified boundaries. This displacement shifts the EIA completeness paradox from a conceptual challenge into a structured procedure.

The seasoned navigator observes technicalisation within proportionate assessment's boundaries. This process invisibilises the completeness paradox through systematic transformation (Maertens 2018). The seasoned navigator acts 'as if' comprehensive assessment is achievable (Rasche and Behnam 2009). Technical rigour creates this illusion of completeness. Social conflicts are recast as measurable parameters—the core invisibilisation mechanism. Clean energy versus ecological protection becomes decibel levels and turbine mortality. These technical substitutions mask fundamental value conflicts. A goal-based framework (e.g., minimising ecological disruption) keeps the process open to future learning. Rule-based protocols simultaneously enforce binding if/then technical steps. This interplay counters information overload while concealing the paradox. The seasoned navigator borrows science's authority to mask this paradox (Hernes and Bakken 2003). Technical metrics make the completeness paradox less immediately pressing.

Regulatory design manages the unsolvable completeness paradox through time-phased conditional commitments (MacKinnon et al. 2018). The tidal project's approval conditions demonstrate this temporal architecture. When impacts are manageable, conditional approval sets a rhythm: approve, monitor and adapt. Acoustic monitoring creates observable commitments at specific intervals. When mortality thresholds are breached, predefined adaptive measures trigger turbine adjustments. Each adjustment generates new data, necessitating further monitoring. Where impacts exceed manageable limits, the assessment may instead recommend non-approval. In either case, phased assessment apportions questions—and their answers—across time. By converting the completeness paradox into a time-bound sequence, the process synchronises decisions without forcing all parties to agree in advance. Each stage defers comprehensive knowledge to the next phase. This sequencing transfers complexity to future stages, displacing the completeness paradox through time. These structured decision pathways facilitate coordinated decision-making despite persistent uncertainty.

In the construction phase following conditional approval, one way seasoned practice responds is to shift focus towards managing expectations and maintaining legitimacy. The paradox does not disappear after approval; what changes is how it must be handled. It is recognised, not resolved. The paradox is selectively foregrounded or backgrounded depending on operational demands. The seasoned navigator employs representative performances (Möllering 2005), such as monitoring reports and adaptation cycles that demonstrate the process remains in hand. These serve dual purposes: gathering data while showing engagement. The assessment logic continues; what changes is its visibility. Each published schedule creates reassurance through predictability and visibility. When monitoring reveals unexpected patterns, the EIA system reframes surprises as learning opportunities. The procedures convert the paradox into documented criteria and scheduled reports, fostering an appearance of manageability. This sustains continuity even as the underlying paradox remains unresolved.

Phased approvals and rolling monitoring reports generate demands of their own. Distributing decisions across time multiplies handovers, interfaces and accountability points. At these interfaces, legal defensibility re-enters, along with stable references such as benchmarks and limits. Legal defensibility is not the solution to paradox. It is the form the paradox takes in legal communication, once adaptive openness must give way. The EIA system never fully reaches closure. Law, coordination and cross-system communication stand in its place, relocating tension into compliance, documentation and thresholds. Adaptive, time-distributed management cannot persist indefinitely without renewed institutional demands. These are the map follower's connectivity demands, returning under institutional pressure to lock decisions into legally defensible thresholds. No archetype finally resolves the cycle; each solution seeds the next. The completeness paradox never disappears—like the sun, it passes out of view under one solution only to re-emerge elsewhere in a different form. The continued viability of this management process itself hinges on tolerance from the wider institutional environment.

10 | Discussion: Limits of the Recursive Cycle and the Reflexive Turn

Figure 1, introduced in Section 1, traces this recursive cycle through three observational positions. Connectivity deficits produce the map follower's demand for scientific discipline. However, scientific credibility, because it depends on revisability, generates the explorer's circular dependency. Rule-based protocols break this gridlock by stabilising expectations around fixed procedural points. Those protocols then produce the navigator's completeness paradox: Each included variable reveals further variables beyond reach. Temporal management distributes this paradox across decision phases. Each phase reduces complexity but returns the EIA system to the map follower's foundational challenge of reconnecting fragmented disciplines. The cycle perpetuates itself. Each problem becomes the operating resource for the next solution.

Friction in one archetype's view operates as a working condition in another's. The seasoned archetype recognises the EIA system's capacity to transform problems into productive resources. These recurring problems—connectivity deficits, circular dependency and the completeness paradox—persist across the cycle traced in Figure 1. They guide attention when certainty is unavailable, and stabilise focus where resolution cannot be reached. Problems, in this stance, coordinate attention across positions that cannot share a single vantage. Diagnostic capacity belongs to this observational position. The seasoned archetype sees that the EIA system sustains itself through this triad of recurring problems. These problems are not failures to remove but conditions for the system's operation. The EIA system continues to work by treating them as productive features. However, what the EIA system cannot absorb is catastrophic environmental disruption arriving faster than it can be registered.

10.1 | External Disruption: When the EIA System Cannot Keep Up

A threshold arises when environmental destruction outpaces what the EIA system can register, describe and compare. Consider a one-in-a-century storm surge that coincides with cofferdam installation for the tidal project. The EIA system did not cause the storm. The construction schedule it had approved, however, placed infrastructure in harm's way. Cascading effects follow: severe flooding, structural damage, risks to workers and impacts on coastal communities. The EIA system's structure permits fewer responses than the catastrophe demands. Fault attribution is difficult. The event is largely uncontrollable, though exposure was partly a scheduling decision. Quantitative analyses become irrelevant precisely where destruction is most feared (Luhmann 1989). The map follower's compliance documents reference conditions that no longer exist. The explorer's studies assess an annihilated habitat. The navigator's phased conditions presuppose a future the estuary can no longer sustain. This is danger—a threat from outside the EIA system's own procedural choices. The catastrophe demands a political response the EIA system was never designed to provide.

10.2 | Internal Risk Production: When Compliance Cannot Stabilise Acceptance

Where danger arrives from outside, risk originates within (Luhmann 1993). The threshold arises not when procedures fail, but when legally compliant procedures can no longer stabilise acceptance. As one plausible illustration, consider how construction work could disturb estuarine sediment, remobilising buried industrial pollutants. Where monitoring parameters are calibrated for sediment volume, toxicological change passes unregistered. This is the EIA system's operational logic pushed to its limit. Professionally calibrated rules, designed to manage the completeness paradox, produce the very conditions they were meant to prevent. When the consequences surface, fault is traceable to procedural choices. Affected populations refuse quantitative reassurance. Under perceived threat, attention contracts: Fewer interpretations are tolerated, fewer futures remain imaginable. The stronger this contraction, the less additional proof can reverse it. At this juncture, the problem shifts. Once stabilising references no longer hold, attention turns to responsibility. Framing becomes inseparable from assigning fault. Legal compliance no longer provides political legitimacy. A crisis diagnosis changes reality and contributes to the enactment of crisis. The government's attention shifts from environmental harm to its own legitimacy. The ecological crisis is displaced by the political crisis it generated.

The two scenarios reveal a shared structural pattern. They expose conditions under which the archetypes' recursive cycle can no longer convert problems into resources. At each limit, the EIA system cannot convert danger from outside or risk from within into a working resource.[8] The recursive cycle loses its grip. These conditions mark where the archetypes' analytic reach is bounded. Crises arise when the EIA system's structure permits fewer responses than continued operation requires. The archetype lens here addresses the everyday recurring problems that lie within the EIA system's operational range. The seasoned archetype recognises the operational presence of other systems and the constraints they impose. Cooperation works because each system gives up possibilities—science has finite resources, politics has constitutional limits and law has procedural bounds. These limits are forms of complexity reduction. Reducing complexity in this way is necessary for building complexity within the EIA system's own operations. Within that range, diagnostic capacity takes a reflexive form. Conventional EIA asks what risks have been identified. The reflexive question asks what new risks these complexity-reducing procedures are themselves producing. The distinction is between threats identified in the environment and risks produced by the procedures themselves. Figure 4 illustrates the archetype lens at work and the conditions under which it loses its grip. Within that range, the Conclusion traces three diagnostics—one for each archetype. It closes with the foundational questions seasoned operation declines to pursue.

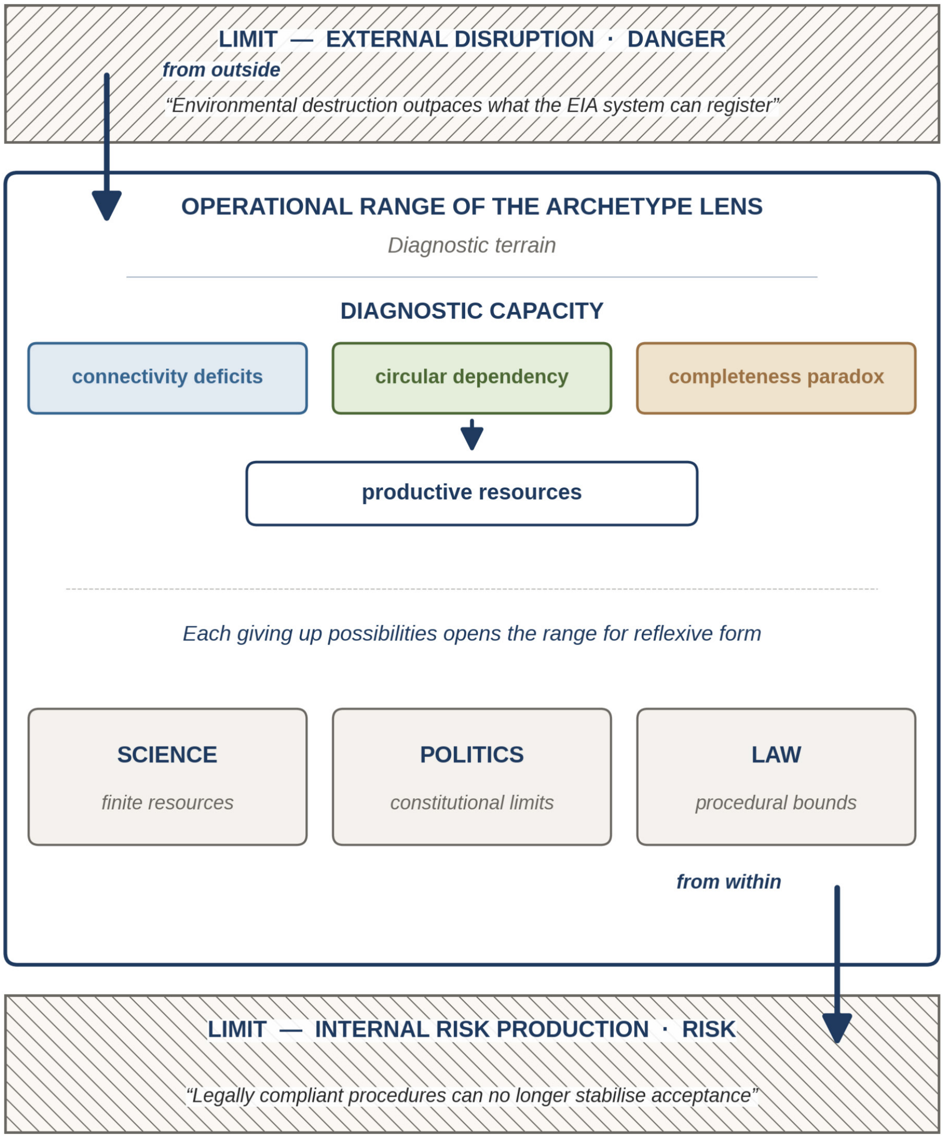

FIGURE 4 | The archetype lens: operational range and its limits. [Colour figure can be viewed at wileyonlinelibrary.com]

11 | Conclusion: Reorienting Problems, Diagnosing Positions

This article has shown how the EIA system sustains itself through recurring problem–solution dynamics. Typical EIA scholarship shares the conventional archetype's orientation: It aims to overcome the recurring problems traced earlier—connectivity deficits, circular dependency and the completeness paradox. The essentialist logic runs: 'in spite of X, Y is best.' This logic is prescriptive: It diagnoses problems for the sake of recommending fixes. The present analysis follows a different logic. It observes from a distance, treating problems as effects of how the EIA system organises its operations. Social systems theory, read through a constructivist lens, inverts the formula: 'because of X, Y is produced.' From this observational position, problems appear not as obstacles but as the conditions through which working resources emerge. For the map follower, connectivity problems across disciplinary systems become the condition from which scientific discipline produces cross-system credibility. For the explorer, interdependent decision-making becomes the condition from which rule-based protocols produce coordination infrastructure. For the navigator, the completeness paradox becomes the condition from which phased decisions produce temporal management capacity. Recurring problems generate practical arrangements only when the EIA system can keep functioning. As discussed earlier, danger from outside or risk from within can overwhelm this capacity and halt the production of such arrangements. By contrast, the EIA system continues to function because it does not try to absorb everything around it. This selective engagement is what prevents information overload from paralysing decision-making. Within these limits, recurring problems are treated differently across conventional and seasoned orientations. The diagnostics that follow map this difference.

11.1 | The Map Follower's Diagnostic

The conventional map follower typically asks: 'Is this data correct?' The seasoned map follower respecifies the problem, asking how findings become credible across disciplines. These questions direct attention to processes of translation, interface-building and selective formatting. Consider a single sediment accumulation dataset. For law, it must become a threshold. For economics, a risk profile. For politics, a defensible narrative. Each translation is tailored to a different audience. The connectivity deficit is not an absence or failure. It is a mismatch between systems that communicate successfully on their own terms but lack a shared format. Disciplinary systems must operate through different codes (Roth and Schütz 2015). Because this mismatch cannot be eliminated, decision-making requires stable translation practices. These translation practices do not dissolve differences; they hold them steady, and that stability is what coordination requires. Conventional orientation treats the connectivity deficit as an obstacle to clear. Seasoned orientation treats it as the reference point around which translation is organised.

11.2 | The Explorer's Diagnostic

The conventional explorer typically asks: 'How can stakeholders find common ground?' The seasoned explorer respecifies the problem, asking which procedures break deadlock. These questions reframe the deadlock from a symptom of breakdown to a design specification. The tidal project illustrates the dynamic: Investors await regulatory approval, regulators demand community acceptance and communities require investment guarantees. Each actor's decision depends on anticipating every other. What appears as blockage is better understood as decision overload generated by mutual anticipation. The seasoned explorer recognises that this circularity cannot be eliminated; it is a structural feature of interdependent decision-making. Rule-based protocols do not dissolve the dependency. They channel it into predictable sequences. An example: 'If habitat loss exceeds the threshold, then a review is triggered.' Such protocols convert mutual anticipation into predictable decision points by narrowing the range of available choices. Conventional orientation treats deadlock as a blockage to clear. Seasoned orientation treats it as the condition that procedural coordination requires. By absorbing uncertainty at one level, rule-based protocols enable more complex coordination at another.

11.3 | The Navigator's Diagnostic

The conventional navigator typically asks: 'Is this assessment complete?' The seasoned navigator respecifies the problem, asking how time is used to manage the completeness paradox. These questions direct attention to temporal distribution rather than comprehensive coverage. The tidal project illustrates this temporal architecture. Conditional approval sets a rhythm: approve, monitor and adapt. Acoustic monitoring creates observable

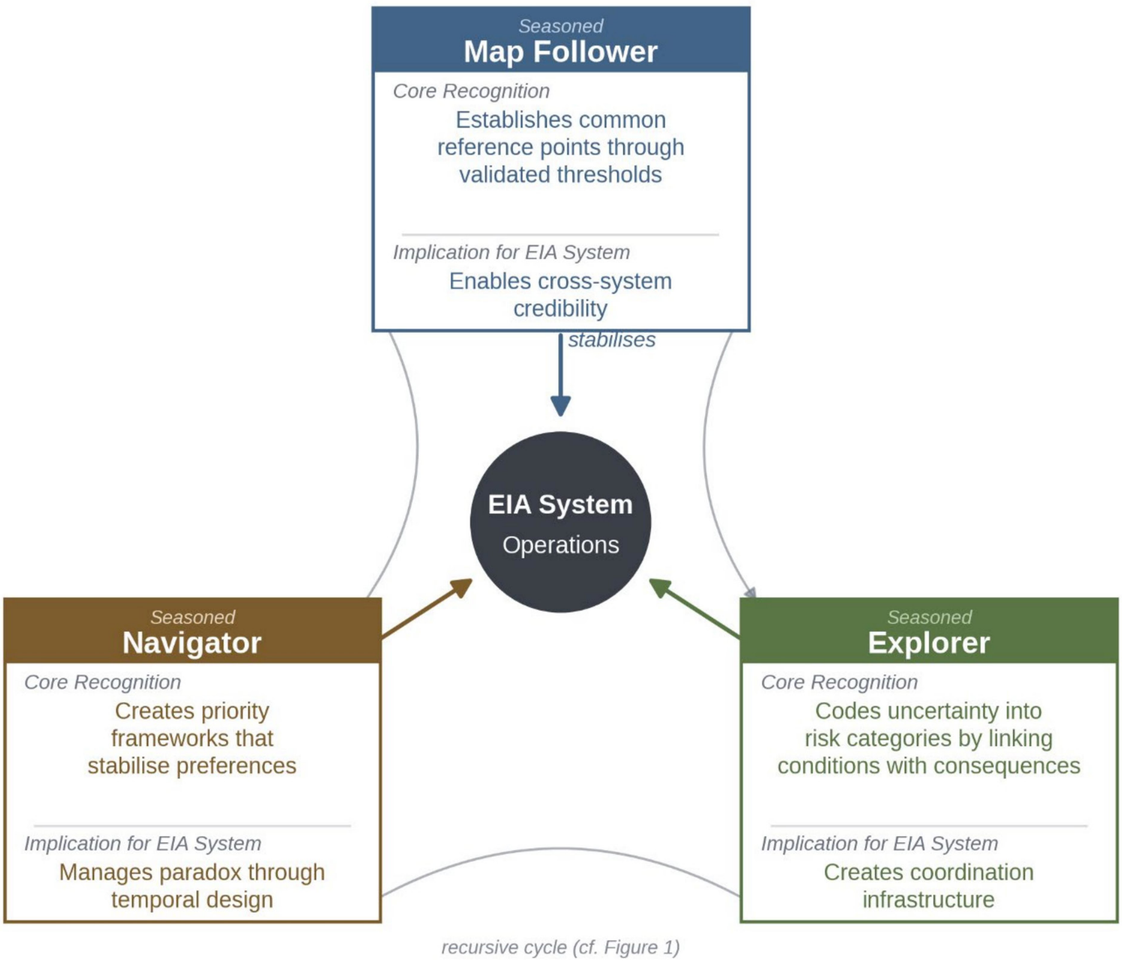

FIGURE 5 | How seasoned archetypes stabilise the EIA system. [Colour figure can be viewed at wileyonlinelibrary.com]

commitments at specific intervals, and predefined adaptive measures trigger adjustments when thresholds are breached. Each adjustment generates new data requiring further monitoring. The paradox is intrinsic to the navigator's position. Any move towards comprehensive assessment exposes further incompleteness, and new information continuously reshapes relevance. The seasoned navigator recognises that the EIA system must avoid demanding closure at any single moment. Temporal distribution relocates the paradox into time, allowing decisions to proceed without requiring completeness. Conventional orientation treats the paradox as an obstacle to comprehensive coverage. Seasoned orientation treats it as the condition that keeps assessment adaptive.

Across the map follower, explorer and navigator, the diagnostics trace a recursive cycle anchored in interdependent decision-making. Scientific discipline produces cross-system credibility, which becomes a reference point for multiple actors. Their coordination generates the explorer's circular dependency (Roth et al. 2024; Žažar and Roth 2026). Rule-based protocols sequence this dependency but fix moments of decision, exposing the navigator's completeness paradox. Temporal distribution manages this paradox; each adaptive cycle then re-demands stable references. The cycle returns to the map follower's connectivity problem. Seasoned archetypes recognise that each solution generates a new understanding of the problem it addresses. This insight orients seasoned archetypes within the terrain of recurring tensions. Figure 5 summarises the recognitions through which they operationalise this orientation.

Together, these recognitions stabilise the EIA system's operations by reducing environmental and social complexity to decision-relevant forms. Seasoned archetypes remain oriented to recognition. They attend to the recurring problem as the system's operating condition, and adjust their framing accordingly. At the same time, certain foundational questions remain unpursued. Examples include 'Why assess impacts at all?' and 'What justifies the assessment regime?' These questions differ in kind from improvement questions. If actively pursued alongside operation, they would unsettle the EIA system's core distinction between acceptable and unacceptable impacts. This would overwhelm decision-making capacity. Leaving these foundational questions unpursued protects the EIA system's core distinction. The archetype analysis does not resolve the three recurring problems. Under the right conditions, recurring problems become working resources that sustain decision capacity over time. This is what the seasoned archetype recognises. The connectivity deficit is worked with, circular dependency coordinated, the completeness paradox managed through time. The question is only under what conditions these dynamics can be openly exhibited rather than evaded, so that decision capacity holds.

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Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

Endnotes

[1] An earlier variation of the archetypes was sketched in Kang (2025), where three observational perspectives were applied to Liverpool's tidal energy assessment.

[2] Circular dependency refers to the condition where each actor's decision depends on anticipating others' moves—mutual decision interdependence. The concept draws on Luhmann's notion of double contingency (Luhmann 1995b; Borch 2011, 41–43). For the full set of terminological adaptations used in this article, see footnote 4.

[3] In Luhmann's terminology, the paradigms function as competing programmes—debatable criteria for correct assessment—within the same code: the distinction between acceptable and unacceptable impacts. The code remains stable across paradigm shifts; what changes is the programme through which it is applied. See Baraldi et al. (2021, 53–54); Luhmann (1989, 36–37).

[4] Key terminological adaptations include: 'circular dependency' for double contingency (mutual decision interdependence); 'the discipline of science' for symbolically generalised media of truth (science system); 'rule-based protocols' for conditional programmes (if-then decision rules); and 'goal-based framework' for purposive programmes (future-oriented goal hierarchies). These adaptations preserve theoretical content while making the analysis accessible to readers without prior systems theory background (see Moeller 2006; Baraldi et al. 2021).

[5] Each guiding distinction corresponds to a first-order observational orientation. The transition from conventional to seasoned within each archetype represents a shift to second-order observation—observing how one's own distinction shapes what becomes visible. See Luhmann (1995b); Moeller (2006, 70–73); Borch (2011, 57–58). For the code/programme distinction introduced earlier, see footnote 3.

[6] The transition from conventional to seasoned within each archetype corresponds to what Luhmann, following Spencer Brown, calls 're-entry': the operation by which a distinction is reapplied within itself. The seasoned form re-applies its distinction to its own operation, producing reflexive awareness without abandoning the original stance. See Baraldi et al. (2021, 205–207); Moeller (2006, 223).

[7] The navigator's strategy of managing paradox through temporal distribution corresponds to what Luhmann calls de-paradoxification—making a paradox operationally workable by displacing its resolution into a different moment, register, or system. Phased assessment makes the EIA system's paradox of completeness manageable by distributing it across time rather than resolving it at any single point. See Luhmann (2018, ch. 5); Baraldi et al. (2021, 166–167).

[8] In Luhmann's terminology, danger denotes a threat attributed to the system's environment; risk denotes a threat attributable to the system's own decisions. The storm surge scenario presents danger; the construction-disturbed pollutants scenario presents risk. See Luhmann (1993, ch. 1).

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