RESPONSIBLE SAND AND SILICATES

Our Theory of Systemic Change and Action

The Coalition for Responsible Sand and Silicates: A structured account of what we believe, why we act, how we work, and what change looks like

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Prepared by the Coalition Secretariat

For development and discussion

This document articulates the Coalition's theory of systemic change and action (TOSCA), drawing on Murphy & Jones (2021). It is a living document intended to evolve as our collective understanding deepens through practice, research, and dialogue with members and partners.

We anticipate a review and upgrading to take place every 6 months in our first phase 2026-2028 as we refine our understanding of our positioning, influence and contributions.

HOW TO READ THIS DOCUMENT

This document sets out the Coalition's theory of systemic change and action. It is structured around four interconnected accounts that together explain *what we believe needs to change, why we think change is possible, how we contribute to making it happen,* and *what transformation looks like as it unfolds.*

The framework draws on Murphy & Jones (2021), who define a theory of systemic change and action as an account of how change emerges through the coordination of three interrelated logics: **intervention design** (what we do and how), **sensemaking** (how actors interpret and legitimise changes), and **capacity building** (how the system develops the ability to sustain and scale change). These three logics are woven through each of the four sections rather than treated separately.

Three additional bodies of work inform the theory and are integrated throughout:

- **The Waters of Systems Change** (Kania, Kramer & Senge, 2018) provides a depth model for understanding where change needs to occur: from structural conditions (policies, practices, resource flows), through relational conditions (quality of connections and power dynamics), to transformative conditions (mental models and deeply held beliefs).
- **Innovation diffusion and crossing the chasm** (Moore, 2014; Rogers, 2010; Centola, 2021) provides a temporal and strategic logic for how new practices move from early adopters to mainstream acceptance, and why behaviour change requires social reinforcement through clustered networks rather than information alone.
- **Innovation and entrepreneurial ecosystems** (Malecki, 2018; Fernandes & Ferreira, 2022) provides a capacity-building logic explaining how new ideas generate value and reconfigure relationships, markets, and institutions when the right ecosystem conditions are in place.

Throughout the document, **[GAP]** flags mark areas where further development is needed. These represent invitations for input from members and partners, not omissions. A living theory is built through use.

> *Our voice in this document reflects who we are: grounded in knowledge and expertise, motivated by the value creation that comes from doing things differently, and always centred on people, places, and impact. We write with quiet confidence in an approach we are building together.*

1. Theory of the Problem

What we believe about the nature and significance of the challenge

The invisible foundation

Sand, gravel, and crushed rock are the most extracted solid materials on Earth. Global consumption exceeds 50 billion tonnes per year — a volume roughly 70,000 times greater than the combined extraction of gold, cobalt, lithium, tin, tantalum, and tungsten. These materials are foundational to at least eight major economic sectors that together represent approximately 11% of global economic value, including construction, glass manufacturing, electronics, water filtration, and energy infrastructure.

Yet sand and silicates remain almost entirely absent from the frameworks, institutions, and narratives that govern how the world manages its natural resources. They do not appear in the Sustainable Development Goals. They are missing from mainstream ESG reporting. They fall outside the scope of every major due diligence framework designed for mineral supply chains. This is not because they are unimportant. It is because they are invisible.

Triple invisibility

We understand this invisibility as operating at three interconnected levels:

Material invisibility. Sand and silicates are transformed beyond recognition in their end products. The glass in a window, the concrete in a bridge, the silicon in a semiconductor — few people trace these back to extraction sites, let alone to the communities and ecosystems affected by that extraction. Unlike a diamond or a bar of copper, the material disappears into its use.

Institutional invisibility. Governance of sand and silicates is fragmented across terrestrial, freshwater, and marine regulatory regimes that rarely communicate with one another. No single institution or policy framework treats these materials as a coherent category requiring coordinated attention. The result is a patchwork of local regulations, sector-specific standards, and jurisdictional gaps that collectively amount to systemic under-governance.

Epistemic invisibility. The dominant mental model — the deeply held, often unexamined assumption — is that sand is abundant, low-risk, and essentially unproblematic. This assumption persists even as evidence accumulates of biodiversity loss from riverbed and seabed extraction, displacement of communities, illegal mining operations, and supply security risks for critical industries. The problem is not a lack of evidence. It is a lack of recognition.

> *In the language of the Waters of Systems Change (Kania, Kramer & Senge, 2018), this is fundamentally a transformative-level challenge. The structural problems — governance gaps, missing standards, absent data — are real and consequential. But they persist because the underlying mental model does not register sand and silicates as materials that require responsible governance. Until that deeper condition shifts, structural interventions remain fragile.*

The mineral security paradox

Sand and silicates present a paradox. They are simultaneously indispensable to ecosystems health and functioning, biodiversity, human wellbeing and security - from meeting basic needs all the way to contributing to major pillars of our societies - and poorly recognised as strategic resources.

This paradox is sharpened by several converging pressures: accelerating urbanisation and infrastructure development and maintenance, growing demand for high-purity silica in semiconductor and renewable energy supply chains; escalating environmental and social consequences of unregulated extraction; and regulatory action that has not yet translated into coherent governance for the scale of our consumption and production of these materials.

To us, this paradox creates an unusual but significant window of opportunity. The gap between the material's systemic importance and its institutional neglect means that relatively modest interventions in visibility, standards, and coordination can have outsized effects — precisely because while so little attention is paid today, once you 'see' the scale, our dependence and the risks and impacts involved in our sourcing and use of these materials you can't 'unsee' it.

The narrative condition

Underpinning the problem is an absence of narrative. The FrameWorks Institute's distinction between *narratives* (patterns of stories in public discourse) and *mindsets* (patterns in public thinking) is useful here. For most materials that have attracted responsible sourcing attention — conflict minerals, cobalt, palm oil — there is a dominant narrative, however incomplete, that can be contested and reshaped. For sand and silicates, the challenge is more fundamental: there is no narrative at all. These materials simply do not appear in the stories the world tells about responsible supply chains.

This means the Coalition's task is not to displace a harmful narrative but to establish a narrative where none currently exists — to make visible what has been unseen, and to make it matter. This is a different and, in some respects, more difficult undertaking than

counter-narrative work, but it also carries a distinctive advantage: the field is uncontested.

[GAP] *Quantified mapping of environmental and social harms across sand and silicate supply chains, disaggregated by material type, extraction method, and geography. The evidence base exists but has not been assembled in a single, accessible source.*

[GAP] *Comparative analysis of how other 'invisible' materials or issues achieved narrative presence and institutional recognition. What can the Coalition learn from precedents in water stewardship, soil health, or marine plastics?*

2. Theory of Change

Why we believe change is possible and what conditions need to shift

The change proposition

The Coalition's theory of change holds that responsible sand and silicates sourcing and production can become embedded in real-world systems through voluntary, collaborative action by supply chain actors who choose to lead ahead of regulation. This is neither a naive bet on corporate goodwill nor a substitute for government action. It is a strategic assessment that, in a field characterised by invisibility and institutional absence, the fastest route to meaningful governance is through the organisations that extract, process, purchase, and use these materials — supported by research institutions, civil society, and aligned policy actors.

The underlying logic runs as follows:

If a credible, multi-stakeholder coalition defines what 'responsible' means for sand and silicates, translating existing OECD due diligence principles into practical guidance for high-volume materials;

- and **if** that definition is tested and refined through demonstration projects with founding members across construction, glass, and manufacturing supply chains;
- and **if** the resulting frameworks, tools, and evidence create a visible reference point that procurement agencies, standards bodies, and regulators can adopt and build upon;
- **then** demand signals from powerful supply chain actors begin to shift market incentives, making responsible practices the path of least resistance rather than an exception requiring justification.

Three depths of change required

Drawing on the Waters of Systems Change framework, we understand that the change we seek operates at three depths, each necessary and each reinforcing the others:

Depth of change	What needs to shift	Coalition contribution
Structural *Policies, practices, resource flows*	Governance gaps filled. Due diligence guidance exists for sand and silicates. Standards bodies include these materials. Procurement specifications reference responsible sourcing criteria.	Normative framework and guidance development. Risk-screening tools. Demonstration projects. Knowledge hub and intelligence sharing.
Relational *Connections, trust, power dynamics*	Cross-sector partnerships that did not previously exist. Trusted working relationships between producers, buyers, civil society, and researchers. Power asymmetries surfaced and addressed.	Multi-stakeholder convening. Working groups and homework series. Community calls. Peer-to-peer learning. Partnership brokering with adjacent initiatives.
Transformative *Mental models, deeply held beliefs*	Sand and silicates recognised as materials requiring responsible governance. The assumption of abundance, low risk, and insignificance displaced by an understanding of systemic importance and shared responsibility.	Narrative strategy and framing. Visibility-building through communications, events, and strategic storytelling. Normative framework that redefines what 'responsible' means in this context.

The critical insight is that structural changes alone are insufficient. A due diligence guidance document that sits unused because no one believes sand needs due diligence represents a structural intervention that fails for want of transformative change. Equally, a shift in mental models without accompanying tools and standards leaves actors willing but unable to act. The three depths must advance together, though not necessarily at the same pace.

Enabling conditions for change

The causal chain connecting current conditions to the change we seek runs through several enabling conditions, each of which unlocks the next:

- **Visibility** enables **recognition.** When actors can see the scale, risks, and significance of sand and silicate supply chains, they begin to register these materials as a domain requiring attention.
- **Recognition** enables **demand.** Once actors acknowledge the problem, they begin to seek solutions — creating market signals for responsible sourcing tools, guidance, and assurance.

- **Demand** enables **standardisation.** As demand for responsible sourcing grows, the business case for developing shared definitions, criteria, and measurement approaches strengthens.
- **Standardisation** enables **integration.** Shared standards allow responsible sand and silicates sourcing to be incorporated into existing procurement, reporting, and regulatory systems rather than requiring entirely new architectures.
- **Integration** enables **normalisation.** When responsible sourcing of these materials is embedded in routine systems, it shifts from exceptional practice to expected conduct — the mental model shifts.

> *This causal chain is not strictly linear. Each link generates feedback that strengthens earlier conditions. A successful demonstration project (demand → standardisation) generates a compelling story (visibility) that deepens recognition and broadens demand. The Coalition's design deliberately creates these feedback loops.*

Why voluntary action leads, and what follows

Existing due diligence and responsible sourcing frameworks — the OECD Due Diligence Guidance for Responsible Mineral Supply Chains, the EU's Corporate Sustainability Due Diligence Directive, and sector-specific standards — were not designed with 50-billion-tonne-per-year materials in mind. They can be adapted, but adaptation requires demonstrated practice, tested tools, and evidence of what works. Voluntary action by leading firms generates precisely this.

A comparative review of 11 existing voluntary sustainability initiatives (including ARM, IRMA, RMI, BCI, FSC, RJC, and RSPO) confirms that voluntary frameworks typically precede and shape regulatory responses rather than the reverse. The initiatives that achieved lasting systemic influence shared several characteristics: multi-stakeholder governance, iterative development of standards through practice, credible assurance mechanisms, and sufficient narrative presence to create social expectations around compliance.

[GAP] *Detailed causal model showing which enabling conditions are most sensitive to intervention and where the highest-leverage investment of Coalition resources lies.*

[GAP] *Articulation of the conditions under which voluntary action is insufficient and regulatory intervention becomes necessary. What is the Coalition's position on the relationship between voluntary leadership and regulatory backstops?*

3. Theory of Action

How we contribute to making change happen, and why our approach is distinctive

The Coalition as ecosystem orchestrator

The Coalition does not seek to be the sole agent of change. Our theory of action is built on the insight that the systemic change we seek requires many actors doing different things, in different places, at different scales, in ways that reinforce one another. The Coalition's distinctive contribution is to create the conditions under which this distributed activity becomes coherent and cumulative.

We describe this role as **generative structuring** — building the light-touch institutional infrastructure within which an ecosystem of responsible sand and silicates practice can emerge, experiment, learn, and self-sustain. This draws on the innovation ecosystems literature (Malecki, 2018; Fernandes & Ferreira, 2022), which shows that sustainable value creation depends not on individual enterprises but on the quality of connections, resource flows, knowledge transfers, and feedback loops across an ecosystem of actors.

Three ecosystem functions define the Coalition's work:

- **Convening and connecting.** Bringing actors together who have never been in the same room: construction material buyers alongside artisanal producers; glass manufacturers engaging with freshwater ecologists; technology firms learning from sand mine operators. The Coalition creates relational infrastructure that enables cross-sector learning and joint problem-solving.
- **Framing and norming.** Developing the shared definitions, criteria, and reference points that allow diverse actors to coordinate without requiring uniformity. The normative framework currently under development through the six-call pre-Älmhult homework series is the primary expression of this function.
- **Demonstrating and diffusing.** Testing solutions in real supply chains through member-led demonstration projects, generating evidence of what works, and creating the stories, tools, and templates that enable others to adopt and adapt proven approaches.

Robust action under uncertainty

The Coalition operates in a field where definitions are still forming, evidence is accumulating but incomplete, and the actors involved bring fundamentally different interests, knowledge systems, and norms. This is not a context for rigid strategic plans. Drawing on the robust action framework (Ferraro, Etzion & Gehman, 2015), the Coalition's approach is characterised by three design principles:

- **Participatory architecture.** The Coalition's governance and working processes are designed to create space for diverse voices. The working group structure, community calls, peer contributions, and workshop-based co-design (such as the Barcelona format) ensure that the definitions, tools, and strategies the Coalition produces carry the legitimacy that comes from genuine co-creation.
- **Multivocal inscription.** The Coalition's outputs — its normative framework, guidance documents, and communications — are designed to mean different things to different actors while maintaining internal coherence. An IKEA sustainability manager, a Vietnamese sand producer, and a Swiss regulator need to find themselves in the Coalition's work without the Coalition prescribing a single interpretation.
- **Distributed experimentation.** Rather than developing a single model and asking all members to implement it, the Coalition supports multiple demonstration projects across different supply chains, geographies, and scales. Each project generates context-specific learning that can be shared across the network.

Crossing the chasm: a temporal logic for action

The Coalition's theory of action also requires a temporal account — an understanding of *when* different kinds of work matter, not just what the work is. Innovation diffusion theory (Moore, 2014; Rogers, 2010) provides this structure.

Responsible sand and silicates sourcing is currently in the early adopter phase. The Coalition's founding members — organisations like IKEA, Roca Group, WWF, and The University of Queensland — are visionary actors motivated by sustainability commitment, first-mover positioning, and the intellectual conviction that these materials matter. They tolerate ambiguity, incomplete tools, and the reputational risk of leading in a field that others have not yet recognised.

The mainstream actors we ultimately need to reach — large-scale aggregates producers, construction contractors, public procurement agencies, glass manufacturers, electronics supply chain managers — operate according to different decision criteria. They are pragmatic, risk-averse, and motivated by demonstrated results, cost certainty, regulatory alignment, and the social proof that comes from seeing peers adopt.

Between these two groups lies the chasm: the discontinuity in the adoption curve where innovations stall if they fail to translate early enthusiasm into mainstream uptake. Crossing this chasm requires the Coalition to shift its strategic emphasis over time:

Phase	Focus	Primary audience	Key mechanisms
Phase 1 2026–2027	Consolidate early adopter coalition. Produce boundary objects: guidance, tools, evidence, and narrative.	Founding members and early allies. Standards bodies and OECD-aligned institutions.	Normative framework development. Demonstration projects. Strategic communications and event presence.
Phase 2 2027–2028	Bridge to early majority. Shift from visionary appeal to pragmatic proof and de-risked adoption.	Procurement agencies, contractors, industry associations, regulatory bodies.	Tested tools and templates. Cost-benefit evidence. Interim certifications and labelling. Regulatory dialogue.
Phase 3 2029+	Mainstream diffusion. Responsible sourcing feels normal, legitimate, and safe.	Broader industry, global buyers, regulators, and standards ecosystems.	Accessible guidance. Scalable assurance. Policy integration. Self-sustaining market incentives.

How change spreads: complex contagion and clustered networks

A crucial insight from Damon Centola's research on social diffusion is that behaviour change does not spread like a virus through weak ties and loose networks. Information travels that way, but meaningful shifts in practice — the kind that shift norms and stick — require what Centola calls **complex contagion**: multiple points of reinforcement across tightly connected groups. People and organisations do not change because they hear something once. They change when their network makes a new practice feel normal, legitimate, and safe.

This has direct implications for how the Coalition designs its engagement. The quarterly community calls, working group structures, peer contribution requirements, and in-person convenings are not merely engagement mechanisms. They are the architecture for complex contagion — building the clustered, trust-rich networks through which responsible sourcing practice can spread. The Coalition deliberately prioritises depth of connection over breadth of reach in its early phases, because the diffusion science shows this leads to faster and more durable adoption.

The sensemaking function

Murphy & Jones (2021) identify sensemaking as one of three essential logics in systemic change. The Coalition's sensemaking function — how diverse actors come to share an interpretation of what responsible sand and silicates means — is embedded throughout its activities but has not previously been named as a distinct element of its theory of action.

The normative framework development process is the Coalition's primary sensemaking arena – the Coalition is facilitating a structured conversation about different 'versions'

of responsible sourcing. Drawing on research into how norms shape practice[1], three distinct normative orientations are in play:

- **Avoidance norms** (Manichean): responsibility defined as the binary absence of specified harms.
- **Process norms** (Continual): responsibility defined as the ongoing identification, management, and remediation of risks.
- **Flourishing norms** (Paradoxical): responsibility defined as both reducing harm and actively contributing to positive outcomes, accepting that both exist simultaneously.

The Coalition does not impose a single normative orientation. It creates the space within which these different understandings can be surfaced, examined, and progressively reconciled into shared guidance that is both aspirational and operationally viable. This is the essence of multivocal inscription in practice.

Positive impact as a distinctive dimension

A particular emphasis within the Coalition's theory of action is the development of a 'positive impact' component that is deliberately decoupled from risk mitigation. Where due diligence and harm prevention represent the 'do no harm' floor, positive impact represents the aspiration to leverage the economic footprint of sand and silicates production for broader benefit.

Three dimensions of positive impact are under development:

- **Economic contribution.** How sand and silicates production lifts local and national economies, and how responsible actors can amplify this contribution.
- **Innovation and progress.** How responsible sourcing practice creates space for new approaches to material efficiency, circular economy, and production innovation.
- **Advocacy and storytelling.** How responsible actors can use their voice and visibility to shift broader narratives and expectations.

> *This approach recognises that large-scale producers need practical pathways to positive impact that leverage their existing operational footprint, rather than requiring fundamental changes to business models. A mine that already employs thousands and purchases locally is already generating economic contribution. The framework makes this visible and encourages its amplification.*

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1 Emerging from Daniel Holm's PhD research, to be submitted in 2026.

[GAP] *The Coalition's distinctive positional theory. A crisp account of what about the Coalition's specific position in the system, configuration of actors, and chosen mechanisms makes it the right vehicle for the changes identified in the Theory of Change. The 'generative structuring' concept begins this but requires further development.*

[GAP] *Adoption factor diagnostics. The seven-factor framework for adoption (performance expectancy, price value, effort expectancy, habit, facilitating conditions, social influence, hedonic motivation) should be adapted from the OreSand context to assess where the Coalition's offerings sit relative to the early majority's decision criteria.*

4. Theory of Impact

What transformation looks like as it unfolds, and how we know it is happening

From milestones to emergent signals

Murphy & Jones (2021) argue that theories of impact in systemic change should look for emergent indicators of system coherence and transformation, rather than relying solely on predetermined milestones and fixed KPIs. Both are needed: operational milestones tell us whether the Coalition is executing its plan; emergent signals tell us whether the system is actually changing.

The Coalition's impact framework therefore operates at two levels.

Operational milestones

These are the Coalition's direct deliverables and organisational achievements, tracked against the 90-day action plans, annual operational plans, and three-year strategic objectives. They include entity formation, charter ratification, membership growth, normative framework publication, demonstration project launches, and revenue targets. These are necessary but not sufficient evidence of impact.

System-level signals of change

These are indicators that the broader system is responding to the Coalition's work and to the change dynamics it catalyses. They cannot be fully predetermined because systemic change is emergent — it produces outcomes that are recognisable but not precisely predictable. We organise these signals across the three depths of change:

Structural signals

- Sand and silicates appear in corporate ESG reporting for the first time.
- Procurement specifications in construction or glass manufacturing reference responsible sourcing criteria for these materials.
- Standards bodies (e.g., IRMA, BCI, green building certification schemes) adapt frameworks to include sand and silicates.

- Regulatory bodies consult the Coalition in policy development processes.
- Resource flows: new funding streams (public, philanthropic, commercial) directed toward responsible sand and silicates.

Relational signals

- Cross-sector partnerships form independently of Coalition facilitation, drawing on its frameworks and connections.
- Members report changed relationships with suppliers, peers, or regulators as a result of Coalition engagement.
- Power dynamics shift: actors previously excluded from conversations about materials governance gain voice and influence.
- The Coalition's convening role attracts actors from adjacent sectors (water, construction minerals, critical minerals) who see alignment with their own challenges.

Transformative signals

- Sand and silicates enter public discourse as a sustainability issue. Media coverage frames these materials as requiring governance.
- Industry leaders reference 'responsible sand' unprompted in public statements, investor communications, or strategy documents.
- New entrants to the Coalition cite peer behaviour and market expectations (not just sustainability conviction) as reasons for joining.
- The question shifts from 'why should we care about sand?' to 'how do we source sand responsibly?'

Narrative change as an impact pathway

The FrameWorks Institute's stages of narrative change provide a useful trajectory for tracking the Coalition's progress on transformative-level impact:

Emergent	Developing	Advanced	Achieved
Narrative product exists (OECD study, WRF presentation, website, pitch materials). The idea is articulated but not widely known.	Narrative is widely available and regularly encountered. Media coverage, event presence, and Coalition communications achieve consistent reach.	Narrative forces changes in decision-making. Procurement, reporting, and regulation begin to incorporate responsible sand and silicates.	Responsible sourcing of sand and silicates is the dominant expectation. The previous mental model of abundance and insignificance has been displaced.
Current position: early Emergent / entering Developing.	Target: solidly Developing by end 2027.	Target: early signals of Advanced by 2029.	Long-term horizon: 10–15 years.

The ecosystem feedback loop

Drawing on the innovation ecosystems perspective, the Coalition's impact is not linear but circular. The feedback loop that sustains change runs roughly as follows:

> *Demonstration projects create evidence → Evidence enables guidance development → Guidance enables procurement shifts → Procurement shifts create market signals → Market signals incentivise production changes → Production changes generate new evidence and stories → Stories deepen narrative presence → Narrative presence attracts new actors → New actors expand the coalition → Expanded coalition enables more demonstration projects*

The Coalition's role is to initiate, maintain, and accelerate this loop. Over time, as the ecosystem matures, the loop should become increasingly self-sustaining — driven by market dynamics and institutional expectations rather than requiring constant Coalition facilitation. This is the capacity-building logic that Murphy & Jones identify as essential: the system develops its own ability to sustain and extend the change.

Spillover effects and ecosystem maturation

A mature ecosystem generates spillover effects — benefits that extend beyond the direct participants. These are among the most important long-term impacts to watch for:

- **Knowledge spillovers:** Coalition-developed tools and guidance adopted by non-member organisations or adapted for adjacent material categories.
- **Network spillovers:** relationships formed through Coalition activities generating independent collaborations, joint ventures, or policy initiatives.
- **Normative spillovers:** the concept of 'responsible sand and silicates' influencing how other high-volume, low-visibility materials are governed.
- **Anchor firm effects:** founding members' participation generating gravitational pull that attracts other actors in their supply chains and sectors.

[GAP] *Development of a monitoring approach for emergent system-level signals. This requires different methods from operational milestone tracking: narrative analysis, network mapping, qualitative signal detection, and periodic Most Significant Change storytelling by members.*

[GAP] *Articulation of what 'success' looks like at 5, 10, and 15 years, distinguishing between Coalition-level achievements and system-level transformation.*

[GAP] *Capacity-building indicators: how do we know the system is developing its own ability to sustain change? What does 'self-sustaining' look like for responsible sand and silicates governance?*

5. Integration: How the Theories Connect

A unified account of the Coalition's systemic change logic

The four theories are not separate modules. They are interconnected accounts that, together, form a coherent explanation of why the Coalition exists, what it does, and how its work contributes to lasting change. The integration rests on four coordinating frameworks:

- **The Waters of Systems Change** provides the **depth model** — telling us *where* change needs to occur across structural, relational, and transformative conditions. This framework is most prominent in the Theory of Change and Theory of Impact, but it also shapes the Theory of the Problem (the invisibility problem is fundamentally a transformative-level condition) and the Theory of Action (the Coalition's activities deliberately target all three depths).
- **Innovation diffusion and crossing the chasm** provides the **temporal logic** — telling us *when* different kinds of work matter and how practices move from early adopters to mainstream acceptance. This framework is most prominent

in the Theory of Action, but it also informs the Theory of Impact (different signals are expected at different phases of diffusion) and the Theory of Change (the enabling conditions chain maps onto the adoption curve).

- **Innovation ecosystems** provides the **scaling mechanism** — explaining *how* change sustains and extends through feedback loops, spillover effects, and ecosystem maturation. This framework addresses the capacity-building logic that Murphy & Jones identify as essential, and is most prominent in the Theory of Impact, but it also shapes the Theory of Action (the Coalition as ecosystem orchestrator) and the Theory of Change (the feedback loops between enabling conditions).
- **Robust action** provides the **coordination mode** — explaining *how* the Coalition navigates complexity and uncertainty through participatory architecture, multivocal inscription, and distributed experimentation. This framework is most prominent in the Theory of Action and shapes the Coalition's organisational design and governance.

> *Together: we understand the problem as one of triple invisibility operating at the transformative level of systems change. We believe change is possible because enabling conditions can be unlocked in sequence and reinforced through feedback loops. We act as an ecosystem orchestrator using robust action principles, deliberately designing for complex contagion across clustered networks and phasing our work to cross the chasm between early adopters and mainstream practice. We recognise impact through emergent system-level signals at structural, relational, and transformative depths, tracking how the ecosystem matures toward self-sustaining responsible governance of sand and silicates.*

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