

FROM OFFSETS TO OUTCOMES: RE-FRAMING NATURE-BASED SOLUTIONS AS PEOPLE-CENTRED PROCESSES¹

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ABSTRACT

Nature-based Solutions (NbS) have emerged as a central mechanism through which the mining sector seeks to reconcile expanding mineral demand under the green energy transition with climate and biodiversity objectives. Understood as approaches capable of delivering simultaneous environmental and social benefits, NbS are increasingly adopted through biodiversity offsets, ecosystem restoration, and forest-carbon initiatives in the sector. Yet growing evidence indicates a persistent gap between these ambitions and outcomes on the ground, particularly in contexts where projects interact with resource-dependent communities and complex governance environments. This paper demonstrates how this implementation gap stems less from gaps in ecological knowledge or standards than from insufficient attention to the social and economic assumptions embedded within project design. Drawing on interdisciplinary literature, practitioner experience, and insights from NbS implementation, the paper diagnoses three structural drivers of this gap. First, the dominance of technical and ecological framings that obscure the sociopolitical processes through which outcomes are produced, leading to simplified assumptions about behaviour change. Second, limited social and economic analysis in early project stages, which may result in theories of change being built on untested assumptions about incentives, governance capacity, and local ownership. Third, how these dynamics contribute to communities being positioned primarily as risks to be managed or beneficiaries of compensation, rather than as active agents in shaping environmental outcomes. Building on this diagnosis, the paper proposes a practical framework for identifying and testing key social assumptions within NbS project design. Focusing on three critical assumption areas – local ownership and governance, economics and behaviour, and social impact and scalability, it outlines key questions and data requirements across project stages to support more robust, adaptive, and context-sensitive decision-making. The aim is not to add new procedural requirements, but to strengthen existing project cycles by embedding social analysis earlier and more systematically. The paper concludes that treating NbS as socioeconomic as well as ecological interventions is essential for improving both conservation effectiveness and investment outcomes. For the mining sector, moving from offsets to outcomes requires reframing NbS as people-centred processes, ensuring that the green transition delivers durable economic and environmental gains alongside inclusive and equitable societal benefits.

KEYWORDS

Nature-based Solutions (NbS), Green Energy Transition, Just Transformation, Social Inclusions, Community Participation, Assumption Testing, Adaptive Management, Inclusive Governance, Sustainable Development.

1. DIAGNOSING THE SOCIAL IMPLEMENTATION GAP IN NATURE BASED SOLUTIONS

1.1. Introduction - The Turn to NbS and the Social Determinants of Outcomes

As demand for critical minerals accelerates under the green energy transition, with consumption for some minerals projected to increase up to sixfold by 2050, the mining sector has become central to decarbonisation efforts while simultaneously intensifying climate, biodiversity, and land-use pressures (Greenfield & Benato, 2022). Mined materials remain indispensable to renewable energy systems and low-carbon infrastructure, yet mining activities themselves remain carbon-intensive, accounting for an estimated 4-7% of global greenhouse gas emissions from extraction, processing, and energy use (UNEP FI, 2024). In response to growing investor and regulatory pressure, more than 75% of metals and mining companies have articulated net-zero emissions objectives (Future Minerals Forum, 2025).

Yet these commitments coincide with a rapid expansion of mining's physical footprint. Mining surfaces have increased by more than 50% since 2000 and are projected to continue growing – heightening risks to ecosystems and resource-dependent communities (Stanimirova et al., 2024). Industrial mining is a major driver of deforestation and is disproportionately concentrated in ecologically and socially vulnerable areas: around 86%

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of metal mines are located in regions of high or intermediate plant biodiversity, and over half of energy-transition mineral projects are situated on or near Indigenous lands (IRENA, 2025; Murguía et al., 2016). This raises critical questions about whether the green energy transition can deliver not only emissions reductions, but also a just transition that avoids transferring social and environmental costs onto the communities and geographies most affected by extraction.

Within this context, Nature-based Solutions (NbS) ranging from biodiversity offsets (BO) and ecosystem restoration to forest-carbon mechanisms such as ‘Reducing Emissions from Deforestation and Forest Degradation’ (REDD+), have been promoted as mechanisms to reconcile extraction with conservation and climate mitigation. In the mining sector, NbS gained traction in the early 2000s alongside carbon markets and voluntary conservation finance and have since been mainstreamed through corporate commitments and international institutions like the World Bank (Bull, et al., 2016). Encouraged as win-win solutions capable of *delivering benefits for climate and people*, the number of NbS-related initiatives and programmes increased approximately sixfold in the last decade, driven largely by development finance institutions and multilateral investment (IDOS, 2020). Yet this promise hinges on human and institutional processes: beyond ecological design, NbS outcomes are produced by how projects engage with governance arrangements, behavioural incentives, and the social contexts in which land-use decisions are made.

At the level of definition, NbS explicitly foreground the interdependence of ecological and social systems. The IUCN (2025) defines NbS as actions to protect, sustainably manage, and restore ecosystems in ways that address societal challenges while simultaneously delivering benefits for human wellbeing and biodiversity. Parallel formulations emphasise the role of human behaviour and governance in sustaining ecological outcomes (Seddon et al., 2020; The World Bank, 2019). In principle, NbS therefore reject the historical separation of people and nature in conservation. Yet despite this conceptual grounding, evidence suggests that NbS implementation often struggles to realise these ambitions in complex, real-world settings (Olivadese, 2025). Across many interventions, particularly in contexts marked by high resource dependence and governance constraints, communities experience uneven social and economic effects, including changes in access to land and resources, livelihood disruption, and limited influence over decision-making (Brockington, 2002; Wong et al., 2022; IEEP, 2020). This gap between theory and practice raises an important question for the mining sector and NbS funders alike: why do interventions framed as people-centred often fail to deliver these outcomes on the ground?

This paper argues that a central driver of this gap lies in the reliance on implicit and insufficiently tested social assumptions embedded within project design. When social context is insufficiently analysed, assumptions become foundational elements of project Theories of Change (ToC) despite limited evidence –shaping feasibility decisions, monitoring frameworks, and investment judgments. Drawing on interdisciplinary literature, sector experience and current practitioner insights, the paper advances three interrelated explanations:

- (A) dominance of technical and ecological framings in NbS design;
- (B) communities’ positioning as risks or beneficiaries, shaped by governance and power relations;
- (C) project lenses that overlook social and landscape dynamics, resulting in fragile ToCs and incomplete measures of success.

1.2 What the Literature Already Establishes: Communities as Central to Conservation Success

Although NbS are presented as separate from traditional conservation projects, in practice they encompass a broad set of ecosystem preservation, forest conservation, and restoration interventions that rely on changes in land and resource-use patterns. As such, they often draw directly on implementation approaches historically associated with conservation practice. This continuity means that NbS do not automatically represent a substantive shift in how conservation is enacted on the ground, even where they are framed as socially inclusive or people centred. For this reason, conservation research and experience on the social dimensions of protection, zonal exclusion, and governance remain directly relevant to understanding NbS outcomes today.

1.2.1 From Fortress Conservation to Socio-Ecological Integration

Longstanding conservation research demonstrates that excluding Indigenous Peoples and local communities from conservation is both socially unjust and ecologically counterproductive (Global Goals, 2025). ‘Fortress conservation’ models, premised on strict regulation or removal of human presence, have been widely criticised for generating rights abuses, undermining livelihoods, and eroding stewardship relationships (Brockington, 2002; West, Igoe & Brockington, 2006). Empirical studies show that Indigenous Peoples and local communities are integral to socio-ecological systems, and that conservation outcomes improve where tenure, knowledge, and agency are recognised. Conversely, interventions that restrict access without viable alternatives

often generate resistance, non-compliance, or displacement of environmental pressures. This literature unsettles a persistent assumption within NbS discourse: that ecological interventions inherently generate positive outcomes. Instead, a wide range of conservation outcomes are shown to be contingent on a strong evidence base, governance arrangements, power relations, and the distribution of costs and benefits across social groups – underscoring the need for early development of context-sensitive theories of change that make social assumptions explicit and testable.

1.2.2 Social Inclusion as a Formalised NbS Requirement

In response to this evidence base, social inclusion has been progressively formalised within NbS standards, safeguards, and guidance frameworks. The International Union for Conservation of Nature (IUCN) Global Standard for Nature-based Solutions, which functions as a certified global benchmark, includes explicit criteria on inclusive and transparent governance, meaningful stakeholder participation throughout the project lifecycle, respect for rights and tenure, and the equitable distribution of benefits and costs. Social considerations are framed as integral to the effectiveness, legitimacy, and long-term sustainability of NbS interventions. Similarly, widely adopted voluntary frameworks such as the Climate, Community & Biodiversity (CCB) Standards and the Business and Biodiversity Offsets Programme (BBOP) Principles require projects to demonstrate early and ongoing stakeholder engagement, respect for customary land and resource rights, and attention to livelihood impacts and community wellbeing as conditions for validation. In offsetting and forest-carbon contexts, these standards explicitly link social performance to the credibility and durability of environmental outcomes.

While these standards are largely voluntary rather than legally binding, they play a significant role in shaping investor expectations and corporate risk assessments. At the level of norms and standards, therefore, there is little ambiguity: NbS are expected to be socially inclusive, rights-respecting, and participatory. Yet despite this convergence between evidence and standards, implementation outcomes frequently diverge from these expectations, suggesting that standards alone do not ensure that the social assumptions shaping project Theories of Change are made explicit, tested, or revised in practice.

1.3 The Implementation Gap: NbS as Social Interventions in Practice

In practice, many NbS interventions continue to incur significant social costs, particularly in forest-based carbon projects, biodiversity offsets, and protected-area-adjacent initiatives (Olivadese, 2025). REDD+ and BO provide instructive examples. Both mechanisms function by protecting forested areas deemed ecologically equivalent to those cleared or degraded by mining, based on project-level estimates of future deforestation and their respective carbon / biodiversity values. These estimates assume that, in the absence of intervention, such forests would be lost due to human activity.

In this way, although offsets within NbS are often framed as technical ecological mechanisms reliant on scientific calculations of biodiversity units or carbon stocks, they are, fundamentally, human projects founded upon the altering of human behaviour. Empirical studies of REDD+ and BO implementation illustrate what this entails in practice, involving the creation of protected forest zones in which local communities are restricted from using land and natural resources. The generation of ecological ‘gains’ is therefore contingent on limiting community access and modifying livelihood practices. In other words, the offsets’ ‘additionality’ – its capacity to compensate for loss – rests on these social restrictions. Yet, despite this fundamental reliance on altering human livelihood practices, the social dimensions of such projects are often under-analysed within their representation, monitoring, and evaluation.

1.4 Why Do These Failures Persist? Structural Explanations

A) Dominance of technical and ecological framings in NbS design

A central explanation lies in the dominance of technical and ecological expertise in NbS design and delivery. Projects are typically led by conservation biologists, ecologists, and technical consultants, with limited integration of social science, behavioural expertise, or political-economic analysis (Raymond et al., 2017; Turnhout et al., 2020). This reinforces a form of green positivism: the assumption that nature-based interventions are inherently beneficial and that ecological restoration or protection will, by extension, generate positive social outcomes (Olivadese, 2025). Such framings can obscure trade-offs, power relations, and the socio-political conditions through which outcomes are produced (Castree, 2020).

This technical orientation is reinforced by what current practitioners understand as a structural misalignment between the societal challenges NbS are designed to address on paper and those experienced within project landscapes. This means that although NbS projects are typically framed around global objectives such as climate mitigation, biodiversity conservation and ecosystem service provision, local contexts are often shaped by more immediate challenges, including poverty, food insecurity, weak governance, and heightened vulnerability. Projects rarely treat these local conditions as a core design concern, even though they strongly shape land-use decisions and livelihood strategies. As a result, NbS interventions are often implicitly expected to compensate for wider development and governance failures, despite lacking the mandate, resources, or institutional reach to do so. When these tensions are not explicitly acknowledged, they become embedded as untested assumptions within project Theories of Change – particularly assumptions about behaviour change, compliance, and uptake of alternatives (Raymond et al., 2017).

B) Weak Social Analysis and Narrow Project Lenses

These framings shape how social impacts are analysed and evidenced within NbS projects. While interventions typically generate detailed ecological data, social impacts are often treated as secondary considerations (Raymond et al., 2017; Turnhout et al., 2020). Social analysis is commonly conducted at an aggregated level, masking differentiated vulnerabilities and impacts at the household scale. Evidence from forest and land-use interventions shows that changes in access, resource use, or enforcement affect households unevenly depending on income sources, tenure security, gender roles, labour availability, and exposure to risk – dimensions that are rarely examined systematically (Cousins, 2024).

These gaps are most pronounced at early project stages, when core design choices and Theories of Change (ToC) are established. Early assessments do not generally include systematic assessment of minimum social enabling conditions such as poverty severity, governance fragility, livelihood dependence, or behavioural drivers to test project feasibility from a social perspective. More detailed socioeconomic analysis is typically introduced later in the project cycle, most often through Social and Biodiversity Impact Assessments (SBIAs), once projects are already structurally defined or scaled. At this stage, social data tends to inform mitigation, compensation, or benefit-sharing measures rather than the underlying logic of intervention. As a result, key assumptions about participation, behaviour change, incentives, and local ownership are embedded into project ToCs before sufficient evidence exists to validate them, limiting the scope for meaningful adaptation downstream. Taken together, these patterns point not to a missing social ‘checkbox’, but to the absence of context-sensitive ToC that treat social assumptions as hypotheses requiring evidence, testing, and revision.

C) Communities as Risks or Beneficiaries of Social Investment

Weak social analysis and technically driven framings translate into two dominant models of community inclusion within NbS practice. First, communities are frequently framed as risks to be managed, particularly where local land use or resource-dependent livelihoods are perceived as incompatible with conservation objectives. This logic underpins contemporary forms of fortress conservation, including exclusionary protected-area models, criminalisation of customary practices, and coercive enforcement. Extensive literature documents the social consequences of these approaches, including livelihood loss, displacement, and erosion of trust between communities and conservation authorities (Brockington, 2002; West, Igoe & Brockington, 2006; Duffy et al., 2019).

Second, even where communities are formally included, they are often positioned primarily as beneficiaries of social investment rather than as active agents of environmental change. Project governance and ownership remain external to the landscape, with decision-making authority concentrated among international developers, donors, buyers, or technical partners. NbS practitioners raise how these power dynamics shape the way inclusion approaches are operationalised – typically through compensation, benefit-sharing, or alternative income-generating activities, rather than through co-design and long-term local ownership. Social safeguards, SBIAs, and grievance mechanisms come to be framed as tools for managing reputational or compliance risk, prioritising procedural compliance over transformative outcomes. As a result, livelihood is reduced to income substitution, participation is limited to benefit receipt, and communities are positioned as recipients rather than co-producers of environmental outcomes. This constrains both the social legitimacy and durability of conservation gains (Smyth & Vanclay, 2017).

1.5 Implications: Towards a Social Transformation Lens

Taken together, this diagnosis shows that the limits of current NbS practice do not stem from gaps in ecological knowledge or the absence of standards, but from a persistent tendency to frame NbS as technical interventions detached from the social processes through which environmental outcomes are produced. Because NbS depend on changes in behaviour, land use, and governance, they function as social transformations as much as ecological ones (Scoones et al., 2020). The implementation gap is therefore rooted in untested or weakly examined assumptions embedded in project ToC – assumptions that shape design, feasibility, and monitoring yet are rarely treated as hypotheses requiring evidence and validation. As recent conservation research highlights (Opatovsky et al., 2025), these assumptions overwhelmingly concern human dimensions, including governance, participation, scalability, and capacity.

For the mining sector, recognising this implementation gap is foundational to moving from offsets to outcomes. NbS that fall short in centring people within their ToC risk undermining both conservation effectiveness and investment value. This points to the need for a more systematic approach to identifying, questioning, and testing social assumptions – one that includes robust governance and capacity considerations from the outset. This is a precondition for delivering inclusive and durable outcomes for both people and nature.

2. STEPS FORWARD: PRACTICAL RECOMMENDATIONS FOR TESTING SOCIAL ASSUMPTIONS IN NBS PROJECT DESIGN

Building on this diagnosis, a more systematic and critical approach is recommended to identify, question, and test the key assumptions that underpin NbS project design. This means embedding social analysis and local knowledge at the earliest stages of project development and ensuring that monitoring, evaluation, and learning (MEL) systems are equipped to track whether these assumptions hold true in practice. The recommendations below aim to provide a practical roadmap for project developers and investors to operationalise this approach, drawing on interdisciplinary evidence and best practice.

2.1. Guiding Principles

The principles below provide a foundation for integrating social dimensions into NbS design and implementation. Together, they support an adaptative learning approach in which assumptions are treated as testable propositions rather than fixed design inputs, ultimately helping projects reduce risk while improving social and environmental performance.

Question assumptions early and often: This entails systematically identifying and interrogating social, cultural, and governance assumptions embedded in the project ToC, early in project design, and treating these assumptions as dynamic and context-dependent rather than fixed or self-evident. Particular attention should be given to assessing critical enabling conditions, including political, social, cultural and economic factors, that underpin the success of project interventions. Where gaps exist, integrating measures into project design to help create a supportive environment should be considered.

Local ownership as a prerequisite, not an add-on: Local ownership should always be a foundational element of project design rather than a secondary consideration. This implies co-defining objectives, governance structures, and benefit-sharing mechanisms with local stakeholders and communities before technical decisions are made. Embedding local ownership from the start not only strengthens legitimacy and social viability, but also creates the conditions for continuously testing, challenging, and refining the social assumptions underpinning the project's theory of change – since those closest to the intervention are best positioned to identify hidden logic gaps, contextual uncertainties, and shifts in social dynamics.

Acknowledge and account for interdependencies and trade-offs: Nature-based Solutions must be grounded in a shared understanding of available options, their costs and benefits, and the social and ecological impacts, both positive and negative. This requires a systemic, landscape-level perspective that considers interdependencies between environmental and social dimensions across multiple scales. It is important to recognise that win-win scenarios are extremely difficult to achieve; and that trade-offs and conflicts are inevitable. Effective NbS shift the focus from maximizing efficiency to fostering resilience and multifunctionality across ecosystems, landscapes, and communities.

Capacity to navigate uncertainty and complexity: Strong planning abilities as well as locally established implementation capacities are essential for NbS projects to succeed. This includes technical competence, organizational strength, access to resources, the ability to retain expertise over the long term, and robust capacity to mobilize and deploy teams effectively on the ground, including in remote or hard-to-access areas. Project teams

– whether through direct staffing or partnerships – must be equipped to manage interrelated ecological, social, and economic objectives.

Leverage interdisciplinary expertise: Involving social scientists, anthropologists, behavioural experts, and local knowledge holders early alongside technical and ecological specialists, helps uncover implicit assumptions and design culturally grounded interventions.

Embed adaptive learning: MEL systems should be designed to track, test, and adapt assumptions throughout the lifecycle, with feedback loops that enable communities to influence decisions. Project teams should treat plans as working assumptions rather than fixed intentions and foster regular learning sessions to review where assumptions have failed and collaboratively identify adaptive strategies.

2.2. Testing Key Social Assumptions in NbS Project Design: Questions and Data for Validation

Building on the Nature Conservancy’s extensive research and framework for identifying assumptions within conservation practice (Opatovsky et al., 2025), and informed by practitioner insights from decades of NbS design and implementation, this paper brings to the fore 3 critical assumption areas that consistently shape NbS project outcomes in practice:

- A) Local Ownership & Governance
- B) Economics & Behaviours
- C) Impact & Scalability

These areas capture the points at which NbS interventions most directly intersect with social, economic, cultural, and political systems - where design choices are most sensitive to context, and where weak or untested assumptions most often undermine delivery. This section provides practical guidance for making these assumptions explicit within NbS projects, outlining key questions and data requirements for each project stage to help developers and investors move beyond implicit assumptions and embed rigorous, people-centred analysis into NbS design and implementation.

A) Local Ownership and Governance

Key assumption: Inclusive governance and participatory processes ensure local ownership, trust, and sustained engagement, enabling fair benefit-sharing.
Underlying assumptions: - Local governance structures have, or can develop, the capacity and legitimacy to make fair decisions, with strengthening or new structures introduced early enough to enable transparent benefit-sharing. - Community participation mechanisms – existing or newly established – are inclusive and resilient to elite capture. - Benefit-sharing is perceived as fair and aligned with community priorities. - External conditions (e.g., political will, land tenure, socio-cultural dynamics) will not undermine participation, fair benefit sharing and local ownership.

The table below outlines the key questions to ask and the information to collect at each stage of the project to test these assumptions:

Phase	Key Questions
Pre-feasibility and feasibility	- Do existing governance bodies have the mandate, capacity and legitimacy to support transparent decision-making and dispute resolution? - Are enabling conditions (land tenure, political will) stable enough to support participation? How do socio-cultural dynamics influence participation and governance? - Does the project team have the capacity to engage communities effectively?
Design and planning	- Have the risks of elite capture been assessed? How will governance arrangements adapt to uncertainty and evolving contexts? - Has a clear process been established for co-designing benefit-sharing rules, FPIC and a grievance mechanism? - Can the project mobilise necessary resources and partnerships to strengthen governance structures?

Early implementation	• Are participation processes representative, transparent and documented? • Have elite capture risks been effectively mitigated? • Are grievances resolved promptly and fairly?
Midline	• Are institutions resolving disputes and delivering benefits equitably? • Are inclusion risks being mitigated?
Endline/Close	• Has inclusive governance delivered trust, legitimacy, and equitable outcomes?

B) Economics and Behaviours

Key assumption: Economic, social, and cultural incentives will motivate lasting behavioural change away from unsustainable practices.

Underlying assumptions:

- Incentives are credible, accessible, and perceived as more beneficial than current practices, considering different segments of the population (e.g., gender, age, socio-economic status).
- Communities perceive benefits as outweighing risks and costs, including short-term transition costs and uncertainties.
- Cultural, social, and political norms do not block adoption of new practices or can be adapted through inclusive processes.

The table below outlines the key questions to ask and the information to collect at each stage of the project to test these assumptions:

Phase	Key Questions
Pre-feasibility and feasibility	• What are the current financial and non-financial benefits of unsustainable practices (income, risk hedging, status, convenience)? • What is the level/percentage of reliance on natural resources for basic subsistence needs? • Are illicit or illegal markets and networks influencing community behaviours and creating competing incentives? • Are there examples of success from conservation interventions in the project area or country?
Design and planning	• Are proposed incentives credible and more attractive than current practices for distinct segments of the population (women/men, youth/elders, land-poor/landed)? • Are incentives timely and reliable enough to influence decisions in agricultural/forest/fishing calendars? • Has the time needed for behavioural changes been assessed, and how does it compare to ecological benefit timelines? • How do communities perceive risks and benefits of change? Do cultural and social norms support adoption, or are there conflicts with formal/informal rules? • Who are the norm influencers or leaders who can legitimize change – and who can veto it? Could incentives be captured by elites or gatekeepers? • Does the project team have the capacity to monitor behavioural change and adapt strategies?
Early implementation	• Are behaviour changes occurring and spreading within social networks? Are there network effects accelerating diffusion, or fragmentation that stalls it? Are there unintended consequences or leakage (including shifts to illegal markets)?
Midline	• Are changes sustained? Are leakage or displacement risks eroding net gains? • Are illicit networks exerting continued pressure on behaviours?
Endline/Close	• Did behaviour change persist and aggregate to desired outcomes?

C) Impact & Scalability

Key assumption: Project interventions can deliver social benefits at sufficient scale and duration to offset the socio-economic costs of transition, while supporting ecological recovery.

Underlying assumptions:

- Transition costs and socio-economic impacts are identified early, remain manageable, and are offset through timely and adequate compensation or support measures.
- Support mechanisms effectively reach those most vulnerable to adverse project impacts and generate benefits that scale from individuals to communities and across the wider landscape.

The table below outlines the key questions to ask and the information to collect at each stage of the project to test these assumptions:

Phase	Key Questions
Pre-feasibility and feasibility	• How many people could be adversely affected by the project? What is the level of community dependency on natural resources? • Which households or locations bear the highest transition costs? What economic opportunities or alternative livelihoods exist? • How accessible are affected communities? Does the project team have the logistical and organizational capacity to deploy support mechanisms at scale?
Design and planning	• What are the unit economics and market viability of alternatives? Do proposed alternatives meet food security and income needs? • Are enabling conditions in place (market access, logistics, social services, infrastructure)? Have transport and market bottlenecks been stress-tested? • Are offset mechanisms commensurate with the magnitude and duration of costs? Are targeting criteria clear and based on vulnerability? • Can the project effectively demonstrate its capacity to reconcile trade-offs between ecological timelines and social priorities?
Early implementation	• Are alternatives profitable and stable across seasons? • Are support mechanisms timely and reaching intended beneficiaries? • Are benefits scaling from households to communities and across the landscape?
Midline	• Are outcomes stable across seasons and shocks? Are bottlenecks resolved?
Endline/Close	• Did alternatives remain viable and deliver net positive outcomes at household, community, and landscape levels?

The table below provides key examples of the data to collect at each stage of the project to test the assumptions detailed above:

Example of Data / Methods to test assumptions
• Institutional and political context screening, including governance and implementation risk identification. • Land tenure assessment using GIS analysis and legal review. • Stakeholder, governance, and influence mapping, including elite capture risk analysis. • Community and household socio-economic analysis, including livelihood composition, dependency on natural resources, vulnerability, seasonality, and risk-hedging functions of resource use. • Incentive and behavioural analysis, including risk-benefit assessment of existing practices, socio-cultural norms diagnostics, and formal and informal rules mapping. • Market and economic systems analysis, including value chains, informal or illicit market dynamics, and unit-economics of alternative livelihoods. • Governance and institutional diagnostics assessing mandates, legitimacy, decision-making processes, dispute resolution capacity, and implementing partner capacity (including ethics and corruption risk). • FPIC processes, co-designed benefit-sharing frameworks, and grievance mechanism design and monitoring. • Participation and implementation monitoring, including participation quality tracking, adoption rates, compliance indicators, and community feedback mechanisms. • Spatial and landscape monitoring, including displacement or leakage risks and accessibility constraints. • Outcome monitoring through panel data and equity analysis, including benefit distribution, income and food security indicators, and behavioural adoption over time.

- Final performance and learning assessments, including governance legitimacy review, unit-economics and equity audits, and lessons-learned and adaptation tracking.

DISCUSSION

Applying this assumption-testing approach to NbS highlights how systematically examining socioeconomic assumptions early in project design can strengthen framing, governance, and management choices. By surfacing assumptions at the outset, issues that would otherwise emerge only during implementation, often once design decisions are already fixed, can be identified and addressed earlier. This creates space to adjust theories of change, refine safeguard strategies, and align management procedures with on-the-ground realities before social challenges become operational constraints. More broadly, Synergy's work with project developers and investors indicates that teams often face uncertainty when anticipating behavioural dynamics, participation, or governance conditions. A structured review of assumptions helps navigate this uncertainty and supports a more grounded understanding of the social and political factors shaping project feasibility. While context matters, early integration of social expertise appears to contribute to more realistic expectations and more balanced designs that consider both ecological and social dimensions.

Several factors may influence how this approach is applied across different contexts. NbS projects often operate in complex socio-ecological settings, where understanding local dynamics and governance environments requires time and resources. This reflects broader findings that many enabling-condition assumptions are difficult to assess and highly context-specific. In addition, developers frequently work within layered safeguard requirements that can fragment analysis and limit attention to the issues most relevant to each landscape. There are also limits to what NbS can reasonably address. These interventions alone cannot overcome structural drivers such as poverty or weak state capacity, and recognising these boundaries is important for shaping realistic project pathways. Despite these challenges, the approach remains adaptable across NbS types because it centres on making project assumptions explicit and testable. Its effectiveness, however, will depend on access to local expertise, institutional flexibility, and the ability to embed adaptive management throughout the project lifecycle.

CONCLUSION

This paper argues that making social assumptions explicit early in the NbS design process can help identify uncertainties around local governance, community behaviour, and the distribution and manageability of socio-economic impacts before they become embedded in the project's logic. Addressing these uncertainties upstream supports more realistic theories of change, reduces the likelihood of overlooking community-related risks, and enables the development of engagement and safeguard plans that are better tailored to local contexts. In practice, early design phases often prioritise technical and financial components, which can limit attention to social dynamics that ultimately influence project viability. Strengthening how these considerations are incorporated at this stage is therefore less about adding new tasks and more about ensuring that design decisions are informed by critical questions and context-specific evidence from the outset.

For the industry, this means adopting design practices that help surface assumptions early, allocate attention proportionally to social and ecological drivers of success, and prepare community participation protocols before project decisions are locked in. These adjustments can improve the robustness and credibility of NbS projects.

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