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Integrating Indigenous and Local Knowledge into Project Management for Sustainable Community Projects: Practices, Outcomes and Gaps.

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Abstract- ***Integrating Indigenous and local knowledge (ILK) into project practice can enhance the relevance, legitimacy, and longevity of interventions, yet approaches and outcomes remain inconsistently reported. This systematic review synthesizes empirical studies that explicitly operationalized ILK within project design, implementation, monitoring, governance, or evaluation, aiming to identify integration mechanisms, enabling conditions, observed outcomes, methodological limitations, and ethical risks. We combined structured database searches with targeted hand searches. Using standardized extraction fields, we recorded geographic context, project stages, types of ILK, stakeholder roles, monitoring metrics, ethical safeguards, and outcome measures. Quality appraisal used QuADS alongside design-specific checklists to assess trustworthiness, reflexivity, and ethical reporting. Quantitative outcomes were tabulated where comparable, and qualitative materials were synthesized thematically to derive integration mechanisms and enabling conditions. Findings indicate that projects explicitly integrating ILK achieved measurable environmental, social, or governance improvements when integration featured genuine co-production, shared governance arrangements, and community control over data. Environmental outcomes included positive trends in species status and habitat condition; social outcomes encompassed reinforcement of cultural practices and improved livelihood resilience; governance outcomes included co-management arrangements and formal recognition of tenure or customary authorities. Successful projects commonly implemented concise hybrid indicator sets pairing scientific metrics with culturally meaningful signals and sustained partnerships through locally governed budgets or data custodianship. Nevertheless, the evidence base has recurring limitations: many studies were short term, indicator sets lacked standardization, Indigenous research methods were underreported, and power asymmetries constrained meaningful co-governance. Ethical risks included data extractivism, intellectual property misappropriation, and donor timelines that short-circuit relational work. These limitations weaken causal attribution and reduce generalizability. We recommend that practitioners and funders ensure Indigenous leadership in co-design and governance; adopt compact hybrid monitoring packages; fund multi-year partnerships with flexible milestones; and embed Indigenous data governance and free, prior and informed consent (FPIC) into agreements. Implementing these measures should strengthen evidence quality, protect community rights, and improve long-term project effectiveness while promoting equitable benefit distribution.***

Keywords: Indigenous And Local Knowledge; Co-Production; Hybrid Monitoring; Data Governance; Free, Prior and Informed Consent; Co-Management; Methodological Limitations; Ethical Risks; Policy Recommendations

I. INTRODUCTION

Indigenous and local knowledge (ILK) comprises the cumulative practices, beliefs, and observational expertise that communities develop through sustained, place-based interaction with their environments. These knowledge systems are relational, adaptive, and embedded in social institutions, livelihoods, and governance practices. They often provide unique, fine-grained information on species, seasonal cycles, risk signals, and land stewardship that are missing from conventional scientific or administrative records (Brondízio *et al.*, 2021).

Despite ILK's clear relevance for biodiversity stewardship, disaster preparedness, and community resilience, mainstream policy and many project cycles

continue to treat it as an optional add-on rather than a foundational design principle. Scholars and practitioners have repeatedly warned that ILK systems face accelerating threats cultural loss, appropriation, and marginalization and that failing to respect and protect knowledge holders undermines the social-ecological foundations that sustain landscapes and livelihoods (Fernández-Llamazares *et al.*, 2021).

Global governance institutions and international policy instruments also show mixed performance in making ILK meaningful within decision-making processes. Systematic reviews reveal that Indigenous participation is frequently symbolic, constrained by capacity barriers, institutional language, and knowledge hierarchies that privilege formal science over lived experience (Zurba & Papadopoulos, 2023). This misalignment helps explain why policies developed far from local contexts sometimes produce trade-offs that erode equity, tenure rights, and culturally appropriate stewardship at the community level (Reyes-García *et al.*, 2022).

Still, practice-oriented research highlights practical pathways to rebalance power: centring Indigenous governance, including community leadership in project steering, and treating external science as complementary rather than directive (White *et al.*, 2024). Reviews focused on climate adaptation and resilience report that ILK yields measurable benefits such as improved forecasting, better timing of resource use, and locally effective adaptation strategies when projects enable genuine co-production, data reciprocity, and safeguards for knowledge sovereignty (Dorji *et al.*, 2024).

Nonetheless, synthesis work reveals persistent gaps: outcome measurement is inconsistent; evaluation frameworks rarely capture cultural and governance benefits; and power asymmetries and weak legal recognition limit scalability and policy uptake. An umbrella review underscores these gaps and the stakes involved: climate change and biodiversity loss jeopardize Indigenous health, livelihoods, and rights, making rigorous and respectful integration of ILK both an ethical imperative and a practical necessity (Brubacher *et al.*, 2024).

This review pursues three linked objectives: (1) map documented practices by which ILK has been integrated into project management; (2) synthesize measured social, ecological, and governance outcomes reported by peer-reviewed studies; and (3) identify methodological and policy gaps that hinder equitable, durable uptake of ILK in community-focused projects.

II. METHODS

Search strategy and information sources

We developed a transparent, reproducible search strategy to locate empirical studies documenting ILK integration into project management across community development, conservation, and disaster risk reduction contexts. Major bibliographic databases searched included Scopus, Web of Science, PubMed/MEDLINE, Embase, and JSTOR, supplemented by regional repositories such as African Journals Online and specialist conservation and disaster risk journals[8]. Search queries paired controlled vocabulary and free-text terms for example “Indigenous knowledge” OR “local knowledge” OR “traditional ecological knowledge” OR “ILK” with project and monitoring terms such as “project management” OR “community project” OR “monitoring and evaluation” to maximize sensitivity and specificity (Page *et al.*, 2021).

Grey literature, hand searching and language criteria

To capture non-indexed and practice-oriented reports, we hand-searched references of included studies, scanned relevant organizational websites, and logged grey literature for sensitivity analysis (Hadlos, Opdyke, & Hadigheh, 2022). We included records published in English, French, and Portuguese and focused on the period 2018–2024 to emphasize recent advances while allowing detection of emerging trends (Hadlos, Opdyke, & Hadigheh, 2022).

Search yield and study selection

Combined database and hand searches identified 5,286 records[8]. After removing 1,374 duplicates, 3,912 unique records underwent title and abstract screening. From these, 3,600 records were excluded at title/abstract screening for failing to meet inclusion criteria, leaving 312 full texts for eligibility assessment. Full-text review excluded 280 articles (not reporting empirical project outcomes, n = 120; ILK not

central or operationalized, n = 68; inappropriate study design for outcome assessment, n = 45; inaccessible full text or language beyond inclusion, n = 47). The final synthesis comprised 32 studies: qualitative case studies (n = 18), mixed-methods project evaluations (n = 6), and quantitative monitoring outcome studies (n = 8). These counts appear in Figure 1 (PRISMA flow diagram) to ensure transparency and reproducibility of the screening process (Page *et al.*, 2021).

Eligibility criteria and ILK definition

We included studies that described a named project or intervention explicitly integrating ILK into design, implementation, monitoring, governance, or evaluation and reporting at least one measurable outcome or monitoring metric (Yanou *et al.*, 2023). Eligible project types were community development, conservation (including co-management and protected area initiatives), and disaster risk reduction or early warning systems (Yanou *et al.*, 2023). Studies qualified if they operationalized ILK either by defining its components (for example seasonal calendars, local hazard indicators, stewardship rules) or by documenting how ILK informed project decision-making (Yanou *et al.*, 2023).

Data extraction and synthesis approach

A standardized extraction template recorded bibliographic details and variables such as geographic context, project stage (design, implementation, monitoring, scale-up), ILK types (ecological indicators, seasonal calendars, ritual or governance rules, early warning signals), stakeholder roles and power arrangements, and measured outcomes (ecological metrics, livelihood indicators, governance changes) (Mandeville *et al.*, 2023). We documented co-design methods (workshops, participatory mapping, joint indicator selection), capacity-building activities, and reported data governance practices. For synthesis we adopted a convergent segregated approach: quantitative results were tabulated and described, while qualitative material underwent thematic synthesis to identify common practices, enabling conditions, and evidence gaps (Mandeville *et al.*, 2023).

Monitoring metrics and outcome grouping

To facilitate cross-case comparison, we grouped reported outcomes into three pragmatic categories: ecological/biophysical outcomes (e.g., species counts, habitat extent), social-institutional outcomes (e.g., formalized co-management agreements, tenure recognition), and livelihood/resilience outcomes (e.g., household food security, reduced evacuation times) (Danielsen *et al.*, 2021). For each metric we recorded measurement methods, reporting cadence, and local custodianship to make comparability transparent and reproducible (Danielsen *et al.*, 2021).

Quality appraisal and risk-of-bias assessment

Given heterogeneous designs, we applied appraisal tools suited to mixed evidence. QuADS was used where studies combined multiple methods, complemented by design-specific checklists (for example JBI critical appraisal tools) for discrete qualitative or quantitative components (Harrison *et al.*, 2021). Appraisal emphasized trustworthiness elements credibility, reflexivity, and ethical reporting alongside sampling and measurement validity for monitoring outcomes. Appraisal findings informed the narrative certainty assessment rather than a pooled certainty score (Harrison *et al.*, 2021).

Ethical reporting and Indigenous data governance

We extracted whether studies reported community consent processes, benefit sharing, local control of data, co-authorship, or community sign-off. Respect for Indigenous data sovereignty and culturally appropriate consent processes was treated as an important marker of ethical robustness; studies that demonstrated explicit data governance practices were noted for higher procedural quality (Reyes-García *et al.*, 2022).

Decolonizing methods and community partnership practice

To evaluate whether integration was substantive, we recorded whether studies implemented decolonizing or Indigenous-led research ethics (for example community research agreements or community-led ethics review) and whether research outputs included community co-authors or documented benefit sharing (Fournier *et al.*, 2023). This information helped distinguish tokenistic consultation from genuine co-design and co-management (Fournier *et al.*, 2023).

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Figure 1: PRISMA flow diagram

Figure 1 displays the following counts: records identified (n = 5,286); duplicates removed (n = 1,374); records screened (n = 3,912); records excluded at title/abstract stage (n = 3,600); full texts assessed for eligibility (n = 312); full texts excluded with reasons (n = 280: not empirical = 120; ILK not central = 68; wrong study design = 45; inaccessible or language beyond inclusion = 47); and studies included in synthesis (n = 32) (Page *et al.*, 2021).

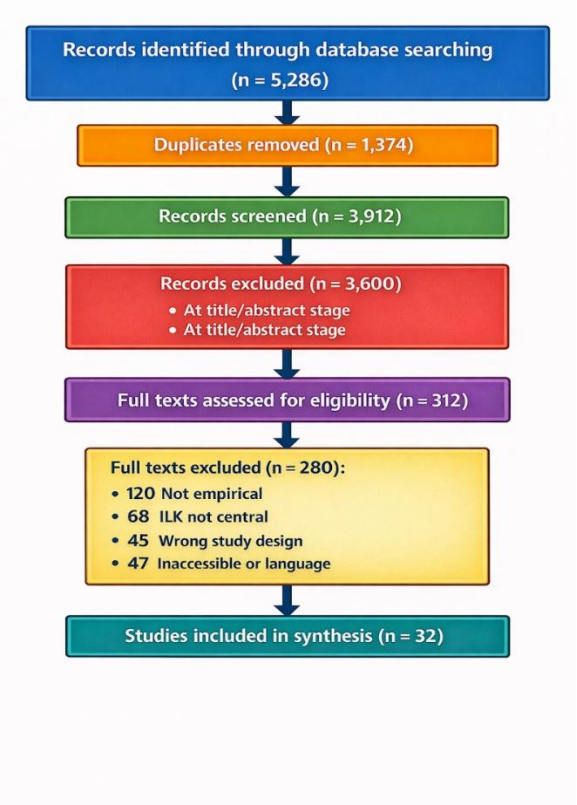

Figure 1. PRISMA flow diagram of study selection for the systematic review (Page *et al.*, 2021).

Colored boxes and arrows indicate sequential screening stages from identification to final inclusion; numbers (n =) are counts of records or studies at each step. The yellow box presents the full-text exclusion breakdown with explicit reasons and counts. Abbreviations: PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses; ILK = Indigenous and Local Knowledge; n = number of records/studies.

Table 1 lists the standardized extraction fields used to capture study and project details for synthesis, illustrating what information was collected and why it matters for reproducibility.

Table 1 — Data extraction variables

Extraction field	Description	Citation(s)
Project stage	design, implementation, monitoring, scale up	(Mandeville *et al.*, 2023)
ILK type	seasonal calendars, local early warnings, governance rules	(Yanou *et al.*, 2023)
Stakeholder roles	community elders, local monitoring teams, NGOs, government	(Danielsen *et al.*, 2021)
Outcomes measured	species abundance, household income, evacuation lead time	(Danielsen *et al.*, 2021)
Monitoring metrics	indicator name, frequency, data custodian, validation method	(Mandeville *et al.*, 2023)
Ethical practice	consent, benefit sharing, co-authorship, data sovereignty	(Reyes-García *et al.*, 2022)
Quality appraisal approach	QuADS and design-specific checklists for qualitative and quantitative parts	(Harrison *et al.*, 2021)
Decolonizing practices	community research agreements, Indigenous-led ethics review, co-authorship	(Fournier *et al.*, 2023)
Participatory monitoring insights	gender disaggregated monitoring and	(House *et al.*, 2023)

	participatory data collection best practice

Three column layout: Extraction field, short description or citation or example entry.
Abbreviation: ILK= Indigenous and local Knowledge; QuADS= Quality Assessment with Diverse Studies

III. RESULTS AND DISCUSSION

Overview of included studies

The literature examining ILK integration into project management is geographically diverse but uneven, dominated by regionally focused case studies and qualitative evaluations, with a growing number of mixed-methods and participatory action research designs published since 2018 (Thompson, Lantz, & Ban, 2020; Moussy *et al.*, 2022)). The evidence displays regional clusters in the Global South (notably southern Africa and parts of Southeast Asia) and in settler-colonial contexts such as Canada, Australia, and New Zealand, where Indigenous governance innovations have been comparatively well documented (Tengö *et al.*, 2021).

Table 2 summarizes included studies by study ID, country/region, sector, and design, providing a compact overview of geographic distribution, sectoral emphasis, and key outcome measures.

Table 2 — Study characteristics and geographic distribution

Study ID	Country / Region	Sector	Study design	Key outcome measures	Citation(s)
S1	Canada	Conservation	Case study; qualitative + monitoring data	Population recovery; co-management agreements	(Thompson, Lantz, & Ban, 2020)
S2	Southern Africa	Natural resource management	Semi-systematic review; mixed methods	Documentation of methods; decolonising processes	(Moussy *et al.*, 2022)
S3	Indonesia	Community development	Participatory co-design pilot	Community resilience; revived practices	(Utami *et al.*, 2022)

Rows are individual studies (Study ID) with columns for Country/Region, Sector, Design and Key outcomes. Abbreviations: S# = Study identifier (for example S1); n/a = information not reported.

Models and mechanisms for integrating ILK into project management

Integration mechanisms across cases fall into three broad categories: (1) formal institutional arrangements (co-management treaties, Indigenous Protected and Conserved Areas, contractual agreements) that embed ILK into governance; (2) participatory co-design processes that intentionally include ILK holders at planning stages; and (3) customary or informal practices that operate parallel to formal projects and shape on-the-ground decisions (Utami *et al.*, 2022).

Formal co-management can create legal and funding pathways for sustained ILK inclusion, but its success depends on redistributing power and enforcing Indigenous authority rather than offering symbolic consultation (Swerdfager & Armitage, 2023). Participatory co-design implemented with authentic power-sharing and iterative feedback often yields contextualized outcomes revived livelihoods and culturally appropriate monitoring metrics although it requires time, facilitation capacity, and funder flexibility (Utami *et al.*, 2022). Informal mechanisms local rituals, customary rules, and seasonal calendars frequently act as operational constraints and enablers; projects that respect these systems typically achieve stronger community buy-in and sustainability (Manda *et al.*, 2023).

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Table 3 maps typical integration mechanisms across project stages (initiation, implementation, monitoring) and links these to illustrative indicators, helping practitioners choose where and how to incorporate ILK into project cycles.

Table 3 — Integration mechanisms by project stage

Project stage	Mechanism examples	Typical indicators	Citation(s)
Initiation	Co-design workshops; tenure recognition	FPIC process completed; leadership co-chairs	(Utami *et al.*, 2022)
Implementation	Co-management agreements; community monitoring	Joint planning minutes; shared dashboards	(Swerdfager & Armitage, 2023)
Monitoring & adaptive management	Locally led monitoring; customary indicators	Cultural indicators; long-term stewardship agreements	(Manda *et al.*, 2023)

Left column lists project stage; adjacent columns show mechanism examples and typical indicators. Abbreviations: FPIC = Free, Prior and Informed Consent.

Roles and power dynamics of stakeholders

Who holds decision-making authority matters as much as what knowledge is documented[23]. Studies consistently identify three stakeholder roles: Indigenous leadership (knowledge holders and rights bearers), NGO or university facilitators (technical bridging roles), and government actors (regulatory and funding authorities) (Udah, 2024). Power imbalances arise when knowledge is extracted rather than stewarded by communities, when external actors control data and interpretation, or when consent processes are superficial (Kukutai & Taylor, 2023). Recent analyses emphasize relational accountability and Indigenous governance of project processes; practical measures include shared governance bodies, Indigenous control over budgets, and explicit agreements on authorship and data ownership (David-Chavez *et al.*, 2024).

Table 4 summarizes stakeholder categories, typical roles, decision authority, and consent mechanisms reported in the literature.

Table 4 — Stakeholder roles, decision authority, and consent mechanisms

Stakeholder	Typical role	Decision authority	Consent mechanism	Citation(s)
Indigenous communities	Knowledge stewardship, on-site leadership	Co-decision or primary authority where IP/tenure recognized	FPIC / collective consent; community protocols	(Udah, 2024)
NGOs / academia	Facilitation, method design	Advisory; can support governance but must cede control	Memoranda of understanding; benefit sharing	(Kukutai & Taylor, 2023)
Government	Regulation, funding	Often dominant; can enable or constrain	Legal recognition; policy instruments	(David-Chavez *et al.*, 2024)

Stakeholder types in rows with columns for Typical role, Decision authority and Consent mechanism. Abbreviations: FPIC = Free, Prior and Informed Consent; IP = Intellectual Property.

Reported outcomes and indicators of success

Reported outcomes cluster into environmental, social, and governance domains. Environmental gains include improved species populations and habitat protection when ILK guides management priorities and seasonal restrictions (Slough *et al.*, 2021). Social outcomes commonly reported include strengthened cultural practice, improved livelihoods, and greater intervention legitimacy. Governance outcomes include new tenure arrangements, co-management agreements, and formal recognition of Indigenous authorities (Varghese & Crawford, 2021).

Monitoring approaches vary: some projects implement hybrid monitoring that pairs scientific indicators with ILK-based signals; others rely primarily on locally meaningful indicators. The most robust programs explicitly connect indicators to adaptive management cycles (Singh *et al.*, 2021).

Table 5 groups reported outcomes into domains (ecological, social-institutional, livelihood) and matches indicators with monitoring approaches to aid selection of mixed indicator sets.

Table 5 — Reported outcomes and measurement approaches

Outcome domain	Example indicator(s)	Monitoring approach	Citation(s)
Environmental	Species abundance; habitat extent	Hybrid: scientific surveys + ILK seasonal indicators	(Slough *et al.*, 2021)
Social	Livelihood diversification; cultural practice frequency	Participatory surveys; ethnographic monitoring	(Varghese & Crawford, 2021)
Governance	Existence of co-management agreement; budget control	Document analysis; budget tracking	(Singh *et al.*, 2021)

Outcome domains in rows with example indicators and the monitoring approach used in adjacent columns. Abbreviations: ILK = Indigenous and local knowledge; "hybrid" = joint use of scientific surveys and local indicators.

Case examples and best practices

Several well-documented cases illustrate effective integration. In Canada, an Indigenous-led caribou recovery initiative combined rapid conservation actions with a formal agreement that helped reverse population declines and restore culturally significant hunting rights (Lamb *et al.*, 2022). Indigenous Protected and Conserved Areas (IPCAs) demonstrate how legal recognition coupled with community stewardship yields biodiversity and cultural benefits (Mansuy *et al.*, 2023). Participatory co-design pilots in Indonesia show that aligning design processes with local epistemologies can revive traditional practices and generate viable local enterprises that support conservation objectives (Butler *et al.*, 2022).

Best practices evident across these cases include long-term funding commitments, shared governance, capacity building for locally led monitoring, and explicit measures to safeguard ILK and ensure data governance. Table 6 provides selected case studies, their key practices, and principal lessons learned.

Table 6 — Representative case studies and key lessons

Case	Key practice	Result / lesson	Citation(s)
Klinse-Za caribou	Indigenous leadership + formal conservation agreement	Population recovery; cultural reinstatement	(Lamb *et al.*, 2022)
IPCAs examples	Legal recognition + stewardship funds	Biodiversity + cultural benefits	(Mansuy *et al.*, 2023)

Participatory co-design (Indonesia)	Local learning frameworks & product design	Revived practices + livelihoods	(Butler *et al.*, 2022)

Columns show Case name, Practice applied and Observed result or lesson in succinct cells. Abbreviations: none required; case names are proper nouns.

Barriers, risks and ethical considerations

Ethical risks recur across the literature: knowledge commodification, intellectual property misuse, data-extractivist approaches, and donor timelines that undermine the slow, relational work necessary for respectful integration (Williamson, 2023). Data sovereignty and governance are central; projects that fail to secure Indigenous control over data produce long-term harms and erode trust (Williamson, 2023). Conventional IP regimes inadequately protect collective, place-based knowledge, prompting calls for sui generis protections and community protocols (Hudson *et al.*, 2023). Short funding cycles and tight reporting demands often push projects toward quick outputs that prioritize measurable short-term gains over durable relational outcomes, jeopardizing ILK transmission and local governance strengthening (Santy *et al.*, 2022).

Table 7 lists common ethical risks, their effects, and mitigation strategies reported in the literature.

Table 7 — Barriers and ethical risks with mitigation strategies

Barrier / risk	Effect	Mitigation	Citation(s)
Data extractivism	Loss of local control; mistrust	Indigenous data governance agreements; CARE principles	(Williamson, 2023)
IP misappropriation	Commodification of sacred knowledge	Sui generis protections; customary law recognition	(Hudson *et al.*, 2023)
Donor short funding cycles	Superficial engagement	Multi-year funding; flexible reporting	(Santy *et al.*, 2022)

Barrier or risk in first column, Effect in second and Mitigation in third for side by side comparison. Abbreviations: IP = Intellectual Property; CARE = Collective benefit, Authority to control, Responsibility, Ethics.

Methodological gaps and evidence quality

A persistent theme is the scarcity of longitudinal impact evaluations (David-Chavez *et al.*, 2024). Most studies are short-term evaluations or descriptive case studies, limiting assessment of sustained outcomes beyond project lifetimes. Inconsistent indicators and rare common measures hinder meta-analysis and cross-site learning; qualitative narratives are frequently combined with ad-hoc indicators that resist comparability (Reed *et al.*, 2023). Underreporting of Indigenous research methodologies including oral histories and customary monitoring biases the literature by recoding rich epistemic practices into scientific formats and losing contextual meaning (McLean *et al.*, 2023).

To strengthen future evidence, methodological recommendations include embedding longitudinal mixed-methods designs, co-constructing indicators that bridge cultural and scientific metrics, and adopting relational research frameworks that respect co-ownership of data and long-term knowledge transmission. Table 8 pairs common methodological limitations with recommended research designs and timelines.

Table 8 — Methodological limitations and recommended research designs

Limitation	Consequence	Recommended approach	Citation(s)
Lack of longitudinal data	Weak evidence of sustainability	Longitudinal mixed methods; baseline + follow-up at ≥5 years	(David-Chavez *et al.*, 2024)
Inconsistent indicators	Low comparability	Co-constructed indicator sets; indicator mapping	(Reed *et al.*, 2023)
Under-recognized Indigenous methods	Loss of epistemic validity	Use Indigenous methodologies; community IP and authorship	(McLean *et al.*, 2023)

Limitation, Consequence and Recommended approach are presented as three tight columns. Abbreviations/symbols: ≥ means greater than or equal to (for example ≥5 years).

Policy and practice recommendation

Translating lessons into practice, the literature suggests concrete, actionable measures for project managers and policymakers: (1) co-design templates that require Indigenous leadership in all phases of project design and budget control; (2) monitoring indicator packages that pair a small set of comparable scientific metrics with locally meaningful cultural indicators so projects can satisfy donor requirements without sacrificing cultural relevance; (3) funding modalities that shift from short-term project grants to multi-year partnership funds with flexible milestones and locally governed disbursement mechanisms; and (4) legal and data safeguards that embed Indigenous data governance, FPIC, and community ownership of IP into project agreements (Anderson *et al.*, 2023). Practical tools already in peer-reviewed practice include templates for MOUs that specify data governance and benefit sharing, models for jointly managed monitoring dashboards, and training programs that build local capacity for adaptive management and stewardship (Burger *et al.*, 2022). Finally, institutional change is essential: funders and implementing agencies must adapt their appraisal criteria to value relational time, local governance strengthening, and cultural outcomes as core programmatic results rather than side benefits (Garnett *et al.*, 2018).

Table 9 synthesizes policy and practice takeaways into action areas, concrete steps and expected effects. Designed as a short implementable checklist for funders, managers and policymakers.

Table 9 — Actionable recommendations for project managers and policymakers

Action area	Practical step	Expected effect	Citation(s)
Co-design	Require Indigenous co-chairs and shared budgets	Equitable decision making	(Anderson *et al.*, 2023)
Monitoring	Use hybrid indicator sets (scientific + cultural)	Better adaptive management and legitimacy	(Burger *et al.*, 2022)
Funding	Multi-year, flexible funding with local disbursement	Sustained stewardship and capacity	(Garnett *et al.*, 2018)
Legal / data	Insert Indigenous data governance clauses and FPIC	Protect ILK and ensure data sovereignty	(Garnett *et al.*, 2018)

Action area in left column with matching Practical step and Expected effect in the next columns. Abbreviations: FPIC = Free, Prior and Informed Consent; MOUs = Memoranda of Understanding.

CONCLUSION

Integrating Indigenous and local knowledge into project practice yields clearer environmental, social, and governance benefits when communities lead design and data stewardship. While evidence signals positive outcomes, it remains constrained by short study horizons, inconsistent indicators, and underreported Indigenous methodologies. Ethical challenges data extractivism and misuse of community knowledge among them persist and must be central considerations in project risk assessments. Practitioners should prioritize Indigenous leadership in co-design, community data governance, and explicit FPIC. Monitoring should favour concise hybrid indicator sets that pair scientific measures with culturally meaningful signals, standardized where feasible. Future research must invest in long-term, comparative mixed-methods studies to evaluate durability and causal attribution across contexts and transparently document Indigenous methodologies, reflexivity, and power dynamics to improve reproducibility and trust. Funders and institutions should support multi-year, flexible partnerships with dedicated budgets for community governance and capacity building and advocate legal frameworks recognizing and institutionalizing Indigenous knowledge systems through co-management and bespoke protections for collective intellectual property. Sustained commitment to equitable partnerships, ethical practice, and robust evaluation will strengthen evidence, safeguard rights, and enhance the real-world impact of projects that depend on Indigenous and local knowledge.

SIGNIFICANCE STATEMENT

This review synthesizes empirical evidence on practical ILK integration, showing that projects giving primacy to community leadership, shared governance, and local data stewardship achieve measurable environmental, social, and governance benefits. It maps integration mechanisms and enabling conditions, highlights methodological gaps (short study horizons, inconsistent indicators), and draws attention to ethical risks such as data extractivism and misappropriation of community knowledge. The manuscript translates these insights into actionable guidance for practitioners and funders including Indigenous leadership in co-design, compact hybrid monitoring packages, multi-year partnerships, and explicit data governance and consent provisions and defines a research agenda calling for long-term, comparative mixed-methods studies and transparent documentation of Indigenous methodologies. By integrating evidence, ethics, and practice, this review aims to inform policy and project design so that interventions relying on ILK are more effective, equitable, and durable.

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ABBREVIATIONS

ILK — Indigenous and local knowledge.
PRISMA — Preferred Reporting Items for Systematic Reviews and Meta-Analyses.
QuADS — Quality Assessment with Diverse Studies.
JBI — Joanna Briggs Institute.
FPIC — Free, Prior and Informed Consent.
IP — Intellectual Property.
CARE — Collective benefit, Authority to control, Responsibility, Ethics.
NGOs — Non-governmental organizations.
MOUs — Memoranda of Understanding.
IPCAs — Indigenous Protected and Conserved Areas.
S# — Study identifier (e.g., S1).
n — Sample size or count.

CONFLICT OF INTEREST

The authors declare no commercial or financial relationships that could be construed as a potential conflict of interest. All authors affirm impartiality in study selection, analysis, and reporting.

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