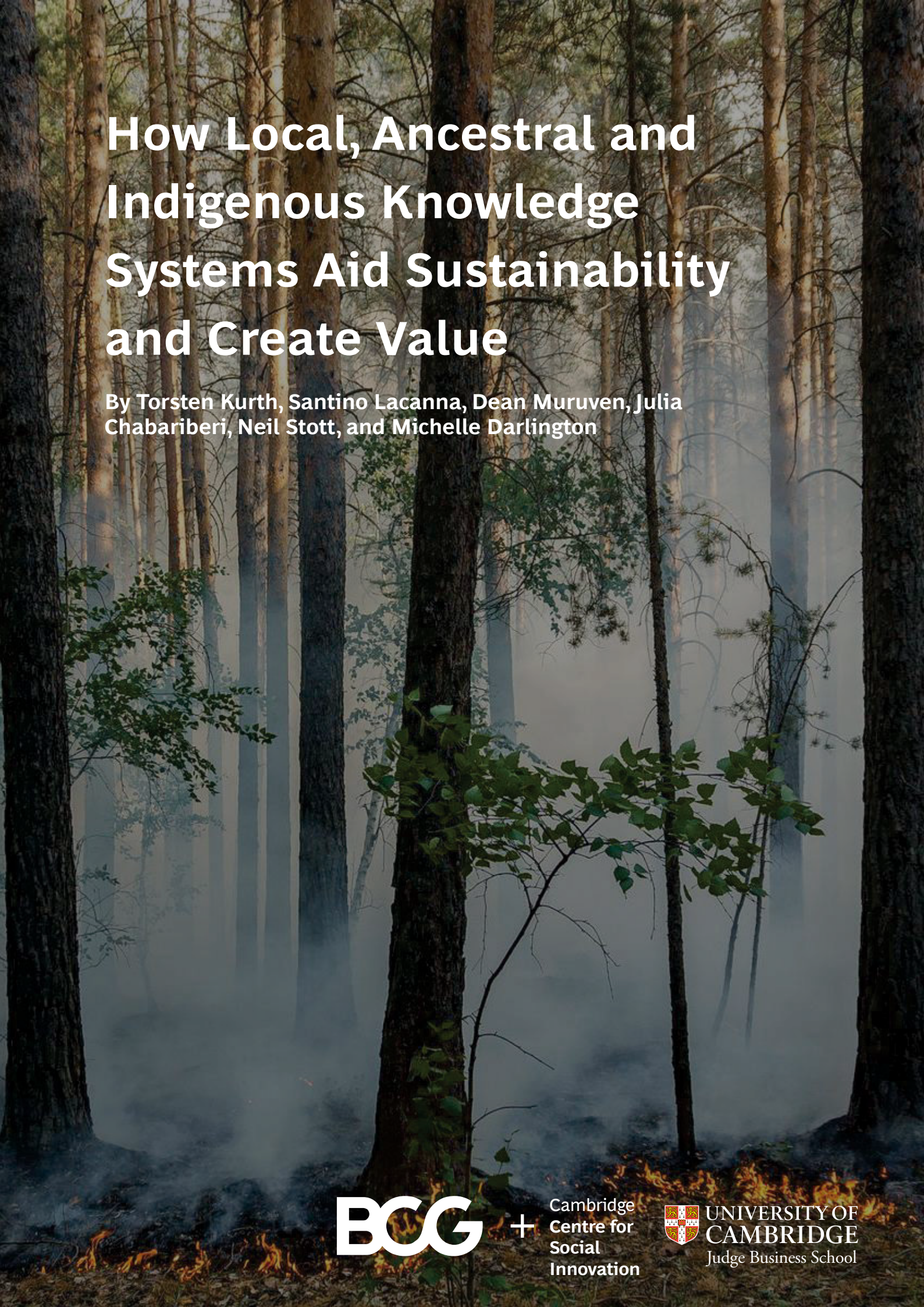

How Local, Ancestral and Indigenous Knowledge Systems Aid Sustainability and Create Value

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1. Executive Summary

In efforts to address the challenges created by climate shifts and the resulting socioeconomic pressures, one resource that could help has been underused: local, Indigenous and ancestral knowledge systems. Referred to collectively as LAIKS, these principles and practices represent the intergenerational wisdom of communities rooted in place in regions around the world. Examples of LAIKS practices include the zaï pits that farmers in West Africa use to capture rainwater; floating gardens in Bangladesh that help control flooding and provide food security; and traditional hafir reservoirs in Sudan that are vital for water security LAIKS can serve as the basis for a hybrid approach to managing and governing natural resources. Organisations may perceive implementing LAIKS solutions as part of environmental or social initiatives as a sunk cost. But it's an investment with a long-term payoff. Using LAIKS to address environmental challenges could create economic opportunities with an estimated value of $150 billion annually, according to previous academic research and BCG analysis.[1]

However, embracing LAIKS means thinking differently about the relationship between nature and society. Because LAIKS are embedded in nature, they prioritise long-term survival and deep sustainability. They value cyclical balance over linear progress and collective survival over individual success.

In addition to thinking differently, implementing LAIKS solutions at scale requires overcoming existing institutional, political, legal, cultural, and socioeconomic barriers. Adopting a framework for regenerative environmental and social initiatives that combines modern science with local and Indigenous leadership and management can help.

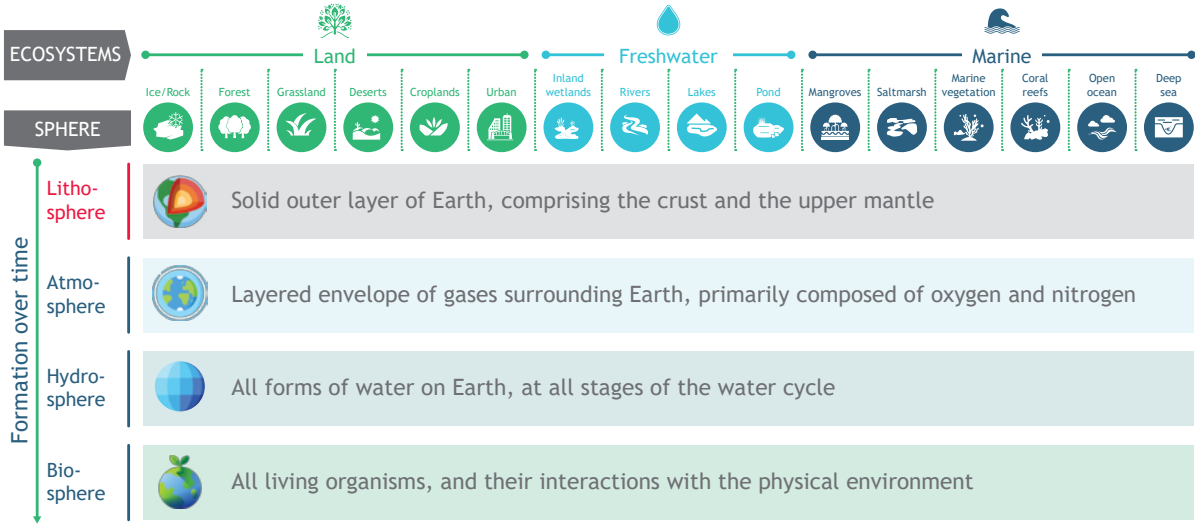
Coalition building, knowledge foundation, and financial access can be 'building blocks for adopting LAIKS approaches. Early successes in improving freshwater management systems in disparate communities around the world show the environmental, social, and economic value that LAIKS solutions can create, including increased economic and societal profitability and related benefits and lower operating cost.

[1] The Biodiversity Crisis Is a Business Crisis, BCG, 2021

2. Nature at a Crossroads

Around the world, the 16 distinct ecosystems that make up the earth's natural environment are under increasing pressure, affecting lands, freshwater sources, and marine waters. (See Exhibit 1.)

Exhibit 1: Nature Is Comprised of 16 Ecosystems That Interact With Four Planetary Spheres



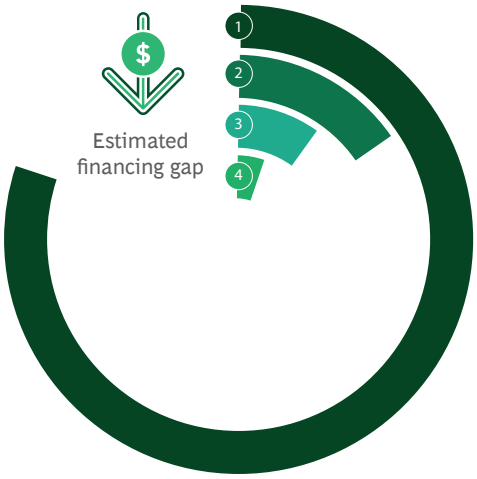
Source: BCG analysis.

These ecosystems support the socioeconomic fabric of populations around the world, making it important to understand the dangers they face. Multiple indicators signal the deepening severity of the situation:

- **Biodiversity Loss.** Since 1970, monitored global wildlife populations have declined 73%, and freshwater wildlife populations have dropped 85%.[2] Without intervention, in the next few decades, as many as 1 million species worldwide could become extinct.
- **Escalating Climate Hazards.** In 2024, the earth experienced 393 major climate events, a 20% increase from the averages between 2010 and 2020. Climate events caused an aggregate $250 billion in economic damage, a nearly 80% increase from the historical average.[3] Previous research from BCG and the World Economic Forum found that continued global warming could intensify climate disasters.
- **Environmental Funding Gaps.** The gap for biodiversity conservation is an estimated $700 billion a year.[4] The shortfall for addressing climate issues is close to $6 trillion annually.[5] (See Exhibit 2.) Adaptation efforts alone require $187 billion to $359 billion annually, far exceeding current funding levels.[6]

[2] Living Planet Report, WWF, 2024
[3] Our World in Data; EM-DAT: The Emergency Events Database
[4] Financing Nature: Closing the Global Biodiversity Financing Gap, Paulson Institute, 2021
[5] CPI Global Landscape of Climate Finance (2024)
[6] Adaptation Gap Report, UNEP, 2024

Exhibit 2: Wide Gaps Exist Between Current Funding and Needed Sustainability Investments



1. **$5.9 trillion climate finance gap.** Current disbu rsements must increase fivefold to reach the $7.4 trillion needed annually through 2030 under the 1.5°C scenario
2. **$1.2 trillion investment in the nature is required from the private sector.** The total includes $896 billion in nature-adjacent investments and $3.2 trillion in direct investments in nature
3. **$700 billion biodiversity gap.** Significant additional financial resources are needed to effectively protect and restore nature
4. **$350 billion gap for adaptation needs in developing countries.** One-third of financing needs are in areas with strong potential for private sector investment

Source: CPI Global Landscape of Climate Finance (2024); Nature Is Banking's Next Opportunity Report (2024); Financing Nature: Closing the Global Biodiversity Financing Gap (2020); UNEP Adaptation Gap Report (2024).

In addition to the nature crisis, global humanitarian systems are experiencing extreme pressures, with needs outpacing available resources:

- **Shrinking Aid.** Key donor countries—including the US, UK, Netherlands, France, and Germany—have reduced foreign aid budgets, affecting such major programs as USAI D and the World Food Program. The gap in humanitarian funding reached approximately 50% in 2024, about $25 billion.[7] In the past decade, funding per person in need declined by nearly 10%.
- **Escalating Need.** The number of people who need humanitarian assistance has surpassed 300 million in 72 countries.[8] At the same time, forced displacement continues to rise, with 123 million people having left their homes involuntarily by end of 2024, underscoring the scale and urgency of the situation.[9]

Because environmental and social crises are linked, any proposed solutions must be multifaceted and coordinated to work. If left unaddressed, the challenges may accelerate, and the world could fall short of existing global climate commitments, such as the Paris Agreement and the Global Biodiversity Framework.

Addressing the challenges could create economic opportunities. Biodiversity generates immense value through ecosystem services such as food provisioning, carbon sequestration, and air and water filtration. Based on academic research and BCG analysis, we believe the value of these services exceeds $150 trillion annually, roughly twice the size of global GDP.[10]

[7] UN OCHA Financial Tracking System
[8] UN OCHA Global Humanitarian Overview Reports
[9] UNHCR
[10] The Biodiversity Crisis Is a Business Crisis, BCG, 2021

3. Why LAIKS Matter Now

LAIKS solutions can help address ongoing environmental, societal, and economic challenges. LAIKS are the social, ecological, and spiritual knowledge, practices, and belief systems of people in relation to their environments. These knowledge systems offer place-based insights, and reflect a nuanced, experiential understanding of local environmental dynamics.

LAIKS include three distinct, yet overlapping knowledge bases:

- **Local knowledge** – knowledge held by Indigenous and local communities that is specific to a particular place.
- **Ancestral knowledge** – wisdom and practices handed down from ancestors, often within Indigenous communities. Ancestral knowledge is an ancient heritage passed from generation to generation, embedded in oral traditions, rituals, and daily life.
- **Indigenous knowledge** – practices, understandings, skills and competencies, philosophies, and worlds views developed by societies with long histories of interacting with their natural surroundings, and with a continuing dependence on natural resources.

LAIKS are being re-visited and adopted to address contemporary challenges. The practices associated with them can be meaningfully integrated into broader societal contexts connecting with locally rooted communities through principles that foster resilience, healing, and sustainability.

Although LAIKS practices differ by region, they share common characteristics. They are:

- **Grounded.** LAIKS are place-based, culture-specific, and rooted in community experience. They are holistic and communal, encompassing a deep understanding of local ecologies, climate patterns, and resource management practices acquired through long-term observations and experiences.
- **Adaptive capacity.** They are dynamic, shifting in the face of new challenges and environ mental changes. Livelihood practices coevolve through a process of mutual adaptation – balancing human needs, strategic responses, and transformations in the natural environment.
- **Sustainable and respectful to the environment.** Practices rooted in these knowledge systems incorporate a deep understanding of and respect for ecological systems and promote sustainable resource use. They have minimal impact on the environment and adapt to ecological changes, fostering healthy and resilient ecosystems.
- **Intergenerational.** The knowledge systems are passed down through the generations in the form of cultural practices, community activities, and language. The transmission process includes understanding physical and spiritual relationships with nature.
- **Culturally and spiritually significant.** Indigenous communities share deep cultural, spiritual, and reciprocal relationships with ecosystems, shaping their identities and ways of life.

Adopting LAIKS solutions can empower communities to engage more effectively with environmental and societal issues. They offer context-specific pathways for fostering more sustainable and regenerative relationships with nature because they are rooted in principles of balance, respect, and harmony between people and the natural world.

Research has shown that LAIKS and Indigenous peoples and local communities (IPLCs) play a critical role in safeguarding land, forests, water, and biodiversity through traditional knowledge systems and sustainable stewardship practices. A 2021 global review found that maintaining Indigenous stewardship directly benefits the environment. At least 32% of the world's land and inland waters – approximately 43.5 million square kilometers – are legally or customarily owned or governed by Indigenous peoples and local communities through legal or customary means. Of these lands, 64% have no or low human modification and are in good condition

ecologically, and 91% have been found to be in good or moderate ecological condition. Additionally, at least 36% of the planet's designated key biodiversity areas lie within IPLC managed lands.[11]

Stymied progress

Despite the positives they have to offer, LAIKS principles historically have been excluded from solutions to address environmental, social, and economic challenges. Continuing to do so could have consequences across multiple dimensions for the private and public sectors and civil society, including:

- **Environmental** – An increased likelihood that developing solutions could harm the landscape or could fall short of ecosystem-wide objectives
- **Social** – Heightened risk of community conflict and loss of trust
- **Financial** – Potentially higher costs from projects that underperform, are delayed, or are shut down and require write-offs
- **Physical** – Increased likelihood of flawed or unsafe project outcomes
- **Regulatory and compliance** – Greater exposure to legal and regulatory setbacks. Failing to meet consultation or consent obligations could result in delayed permits, legal injunctions, or projects being cancelled
- **Reputational** – Greater potential for community opposition and negative media coverage

Several incidents in the recent past illustrate the potential negative outcomes. In the private sector, excluding LAIKS principles and local communities has led to incidents that have affected organizations' social license to operate, the ongoing acceptance and approval by a community for an entity to conduct business activities. Over the past decade, incidents involving enterprises that failed to adequately engaged IPLCs or integrate LAIKS into their social license to operate cost tens of billions of dollars. (See sidebar, 'Overlooking LAIKS Principles Can Have Substantial Consequences.')

[11] The State of Indigenous Peoples' and Local Communities' Lands and Territories: A technical review of the state of Indigenous Peoples' and Local Communities' lands, their contributions to global biodiversity conservation and ecosystem services, the pressures they face, and recommendations for actions, WWF, UNEP-WCMC, SGP/ICCA-GSI, LM, TNC, CI, wcs, EP, ILC-S, CM, IUCN, 2021

Overlooking LAIKS Principles Can Have Substantial Consequences

Recent incidents illustrate the consequences of intentionally or unintentionally excluding local communities and LAIKS principles from business, infrastructure, or other projects that affect the environment. The exclusions can lead to protests, environmental harms, human rights abuses, and reputational damage for private-sector organisations and NGOs.

Community Activism Brings Global Attention to a Contentious Landfill

The Bisasar Road landfill in Durban, South Africa, was the country's largest and had been central to the city's waste management for decades. In the early 2000s, the landfill was tapped to become a pilot project to capture methane gas emissions from waste and convert it into electricity and related carbon credits. The World Bank pledged $14.4 million to support the project, which was hailed as a model of sustainable development.

For local residents, the landfill was something else: a health hazard. The site was located in a neighbourhood with primarily low-income Black and Indian residents, but received waste from wealthier, predominantly white suburbs. People living near the site were exposed to toxic emissions, odours, and leachate, leading to high rates of cancer, respiratory illnesses, and other health issues.

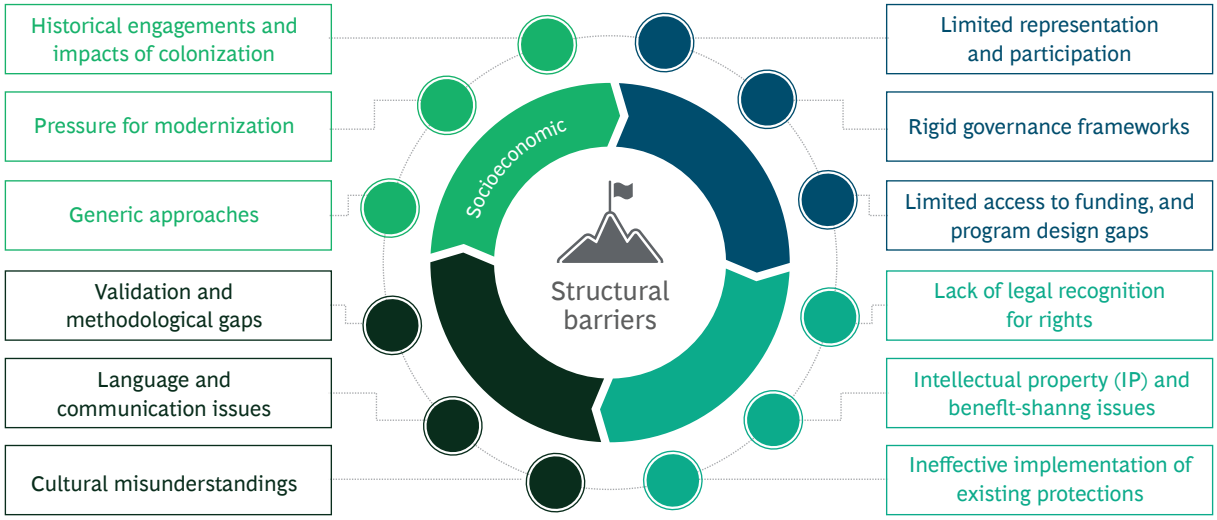
Community activists organized protests and petitions to shut down the site, and a 2005 Washington Post article highlighted the situation.[12] In response, the World Bank withdrew its investment in the methane-to-energy project, marking a turning point in the debate.

[12] Vedantam, S. Kyoto Credits System Aids the Rich, Some Say, Washington Post, March 11, 2005

4. Structural Barriers Stand in the Way of Meaningful Impact

Adopting and scaling LAIKS solutions in public or private initiatives that affect the environment or social wellbeing requires addressing four major structural barriers. (See Exhibit 3.)

Exhibit 3: Structural Barriers Continue to Prevent Meaningful Impact



Source: BCG analysis.

Institutional Barriers. Indigenous peoples remain underrepresented in governance forums. For example, Indigenous people comprise 6% of the world's population, yet at the COP27 climate change conference in 2022, Indigenous representatives comprised less than 1% of the attendees, about 300 people.[13] Although Indigenous people make up approximately 6% of the world's population, only 2.2% of global parliamentarians self-identify as Indigenous.[14] Existing governance frameworks-often designed around standardized project cycles and documentation-fail to accommodate oral traditions or the holistic practices that underpin many Indigenous knowledge systems. Such institutional norms tend to exclude local knowledge holders from critical processes.

In addition, Indigenous communities rarely receive funding for climate. A recent study found that although 93% of impact investors claimed to be aligned with sustainable development goals, only 48% effectively addressed them, and a mere 11% engaged with local communities and knowledge holders, underscoring a persistent gap between intention and inclusive impact delivery.[15]

Political and Legal Barriers. In many countries, Indigenous land tenure and resource rights are unrecognized or legally fragile. As of 2017, IPLCs legally owned at least 12.2% of forest lands and held legally designated rights to over 2.2% of the globe's forest area.[16] More than half the countries included in a 2015 study by the Rights and Resources Initiative did not offer a formal legal pathway for Indigenous communities to obtain land ownership.[17]

[13] Breaking Barriers: Empowering Indigenous Voices in Global Climate and Biodiversity Decisions, Environmental Defense Fund, 2024

[14] Beyond numbers: the participation of indigenous peoples in parliament, Inter-Parliamentary Union, 2014

[15] 5 biggest obstacles to achieving the UN sustainability goals, Cambridge Centre for Social Innovation, 2024

[16] The State of Indigenous Peoples' and Local Communities' Lands and Territories: A technical review of the state of Indigenous Peoples' and Local Communities' lands, their contributions to global biodiversity conservation and ecosystem services, the pressures they face, and recommendations for actions, WWF, UNEP-WCMC, SGP/ICCA-GSI, LM, TNC, CI, WCS, EP, ILC-S, CM, IUCN, 2021

Socioeconomic Barriers. Modernization and standardized policies remain significant barriers to preserving and integrating LAIKS solutions. Only 24 countries have ratified Indigenous and Tribal Peoples Convention, 1989, leaving the majority of nations (especially in Asia and Africa) without legally mandated Free, Prior, and Informed Consent (FPIC) protections.[18] Because of this, many attempts to document Indigenous knowledge have approached IPLCs on unequal terms, or with only partial involvement in the process. These efforts have often provided research and knowledge to external collaborators with less reciprocity to local and indigenous communities.

Cultural Barriers. Western scientific methods don't recognize Indigenous or ancestral ways of knowing. Scientific processes that rely on quantitative data, peer review, and predictive modeling rarely accommodate the oral traditions, experiential insights, or intergenerational wisdom. As a result, vital perspectives, such as elders' observations or seasonal indicators, may be disregarded.

In addition, industrialization, urbanization, and formal education have disrupted intergenerational transmission of Indigenous languages and practices. UN ESCO projects that 50% to 90% of the world's approximately 3,000 Indigenous languages may disappear by the end of the century.[19] When a language dies, knowledge dies with it. Many global platforms operate in dominant languages such as English, Spanish, or Mandarin, excluding Indigenous leaders from participating fully and exchanging knowledge. Cultural misunderstandings also persist, with outsiders at times unknowingly violating cultural protocols, which undermines trust and collaboration. More than 2,200 environmental conflict cases have documented the loss of traditional knowledge due to such disconnects.[20]

[17] Who Owns the World's Land? A global baseline of formally recognized indigenous and community land rights, Rights and Resources Initiative, 2015

[18] ILO, 2025

[19] Multilingual education: A key to quality and inclusive learning, UNESCO, 2024

[20] EJAtlas – Global Atlas of Environmental Justice, 2025

5. Applying Strategic Action to Advance LAIKS

Organisations in both the public and private sectors can take strategic action to overcome the structural barriers we've identified and accelerate implementing LAIKS solutions.

Stakeholders who wish to rebuild trust can recognise IPLCs as equal partners, moving beyond consultation to collaborate with local peoples and communities at every stage of an environmental initiative, including:

- **Co-defining the problem and objectives.** Including IPLCs can shift how parties define, see, and understand the problem.
- **Co-designing solutions.** Including IPLCs in designing solutions can shift how interventions are structured to reflect local geographies, cultural contexts, values, and knowledge.
- **Co-implementation and governance.** Including IPLCs in delivering and evaluating solution can shift how success is measured and learn from past interventions.

Successfully adopting this approach requires taking three strategic actions: coalition building, knowledge foundation, and financial access. (See Exhibit 4.)

Exhibit 4: Three Strategic Actions Can Help Integrate LAIKS into Systemic Practices

Source: BCG analysis.

Coalition building

Addressing climate and biodiversity challenges starts with collective action. Indigenous peoples and local communities can be involved from the outset and participate in codeveloping implementation targets.

For this to be effective, diverse knowledge systems must be included. Stakeholder-led orchestration platforms can act as a bridge between knowledge systems, helping integrate LAIKS into climate policies and projects. Identifying key stakeholders to lead these efforts can help ensure that diverse actors are included and engaged. Leaders can improve the likelihood of success by bringing together experts, government representatives, local communities, and financial institutions, to co-develop innovative solutions with clear measures of success that all stakeholders agree on.

A handful of initiatives to include IPLCs in climate and biodiversity discussions show what's possible.

- The United Nations Framework Convention on Climate Change Local Communities and Indigenous Peoples Platform (UNFCCC LCIPP) helps Indigenous and local
- During the Convention on Biological Diversity (CBD) that took place during the 2024 United

Nations Biodiversity Conference (COP16), parties made history by establishing the first Permanent Subsidiary Body on Article 8(j), securing a permanent role for Indigenous peoples in biodiversity policymaking.

In the private sector, companies are partnering with IPLCs on nature stewardship initiatives. In British Columbia, several corporations joined forces with the Tsay Keh Dene to co-steward the Canadian First Nation's traditional boreal forests.[21] Facilitated by the Earthworm Foundation, the collaboration ensures that corporate pulp and timber supply chains respect Indigenous rights and designates no-harvest zones in ecologically and culturally important areas.

In another example, a Canadian-based mining multinational formed a joint venture with the Quechua Indigenous community of Ollague to develop the Kuska lithium project in the Chilean Andes. Under the agreement, the Ollague community holds a 5% free-carried equity stake and a seat on the project's board, giving it decision-making power and a direct say in managing environmental impacts. For the company, the deal secures local buy in and enhances its reputation as a responsible miner.

Critical Steps to Coalition Building

Consider taking the following actions to cultivate coalition building:

Institutionalize LAIKS. Integrate formal and informal management systems, formalize comanagement and representation within institutions, and foster ethical collaboration grounded in the principles of engaging early, practicing reciprocity, and committing for the long term. Make local knowledge systems a foundation communities participate in global climate processes by sharing their experiences, exchanging best practices, and co-developing climate solutions for problem-solving to scale impact effectively and sustainably.

Change behaviours at the local level. Integrating LAIKS can allow for faster deployment and adaptation of local contexts. To realize this potential, public and private sector and civil society actors can prioritize building strong, local coalitions to address region-specific challenges, foster trust, and ensure sustained engagement.

Look for ways to collaborate. Partner with groups across sectors to enhance interventions' effectiveness. By working closely with local actors, stakeholder groups can contribute to transformative change and deliver measurable impact. The shared responsibility demands a collective shift in focus, with public institutions, private enterprises, and civil society organizations aligning around locally led, coalition-driven approaches.

Knowledge foundation

Projects and policies for climate adaptation and conserving biodiversity require robust data and insights to assess risks, define priorities, guide evidence-based actions, and measure impact. Integrating Indigenous and local knowledge, innovative practices, and accessible information into these efforts helps establish baselines, track progress, and ensure that the way resources are used is sustainable, respectful and equitable.

Several initiatives show how local knowledge can be integrated into environmental and social action projects:

- The UNFCCC LCIPP is including Indigenous knowledge in climate action to promote the exchange of experiences and good practices, and to create a database of best practices and available tools.[22]
- The Kunming-Montreal Global Biodiversity Framework (GBF), adopted at COP15, includes a provision to ensure that decision makers, practitioners, and the public have the data and knowledge they need for effective and equitable governance and integrated and participatory biodiversity management.[23]

[21] Protecting Forests Through Recognition of Indigenous Rights, Earthworm, 2024

[22] Overview – Local Communities and Indigenous Peoples Platform Web Portal

- In 2024, a public-private sector group launched the Brazil Restoration & Bioeconomy Financial Coalition to invest $10 billion in forest conservation and accelerate the country's bioeconomy.[24] The initiative includes an unprecedented mapping of the economic ecosystem of Indigenous and traditional populations engaged in biodiversity-based businesses.

Critical Steps to Knowledge Foundation

To integrate LAIKS solutions into knowledge bases for environmental and social programs, stakeholders can invest in mutual capacity-building; ensure language access; integrate FPIC protocols into assessments, planning, and policies; and protect intellectual property and traditional knowledge. Other actions to consider taking that support knowledge building and exchange:

- **Identify and map existing solutions.** Develop accessible knowledge-sharing platforms and databases that mainstream and facilitate access to LAIKS, which will enhance usability and adoption.
- **Make LAIKS more visible.** Better visibility can raise awareness of localized knowledge and drive impact at scale. That will help increase the likelihood that knowledge will be used to inform policy design, shape implementation, and guide financial flows toward more contextually appropriate and sustainable outcomes.
- **Integrate LAIKS knowledge into academic and research work.** Institutions can play a role in advancing community-engaged work by adopting inclusive research methodologies and knowledge dissemination, including through publication. In addition to independent contributions, academics should collaborate with governments, NGOs, and the private sector to facilitate regular forums where scientists, Indigenous elders, and local practitioners can exchange knowledge and cocreate solutions to climate and water challenges.

Financial access

The global flow of climate funds is massive, but the majority of financial resources bypass Indigenous communities or are allocated in ways that do not acknowledge the groups' role in sustainable land and resource management.

Between 2011 and 2020, less than 1% of total official development assistance for climate mitigation and adaptation went to projects that support IPLC land tenure and forest management, about $270 million a year. Of that limited funding, only 17% went to projects that explicitly refer to an Indigenous peoples' organization in the project title, description, or list of participating entities.[25]

The Global Diversity Framework (GDF) aims to mobilize at least $200 billion a year in domestic and international biodiversity funding from all sources and calls for enhancing Indigenous peoples' role in natural resource management for conserving biodiversity. However, since COP15, evidence of progress toward closing the funding gap is unclear.

Critical Steps to Building Financial Access

Stakeholders can take several actions to accelerate equitable and sustainable funding models that recognize and reward the stewardship of nature. Among them:

- Develop mechanisms to make sharing benefits fair and equitable.
- Challenge short-term decision cycles.
- Simplify access to funding through trusted intermediaries.
- Create regulatory and financial incentives that promote LAIKS-centred solutions.

[23] Conference of the Parties (COP), Convention on Biological Diversity

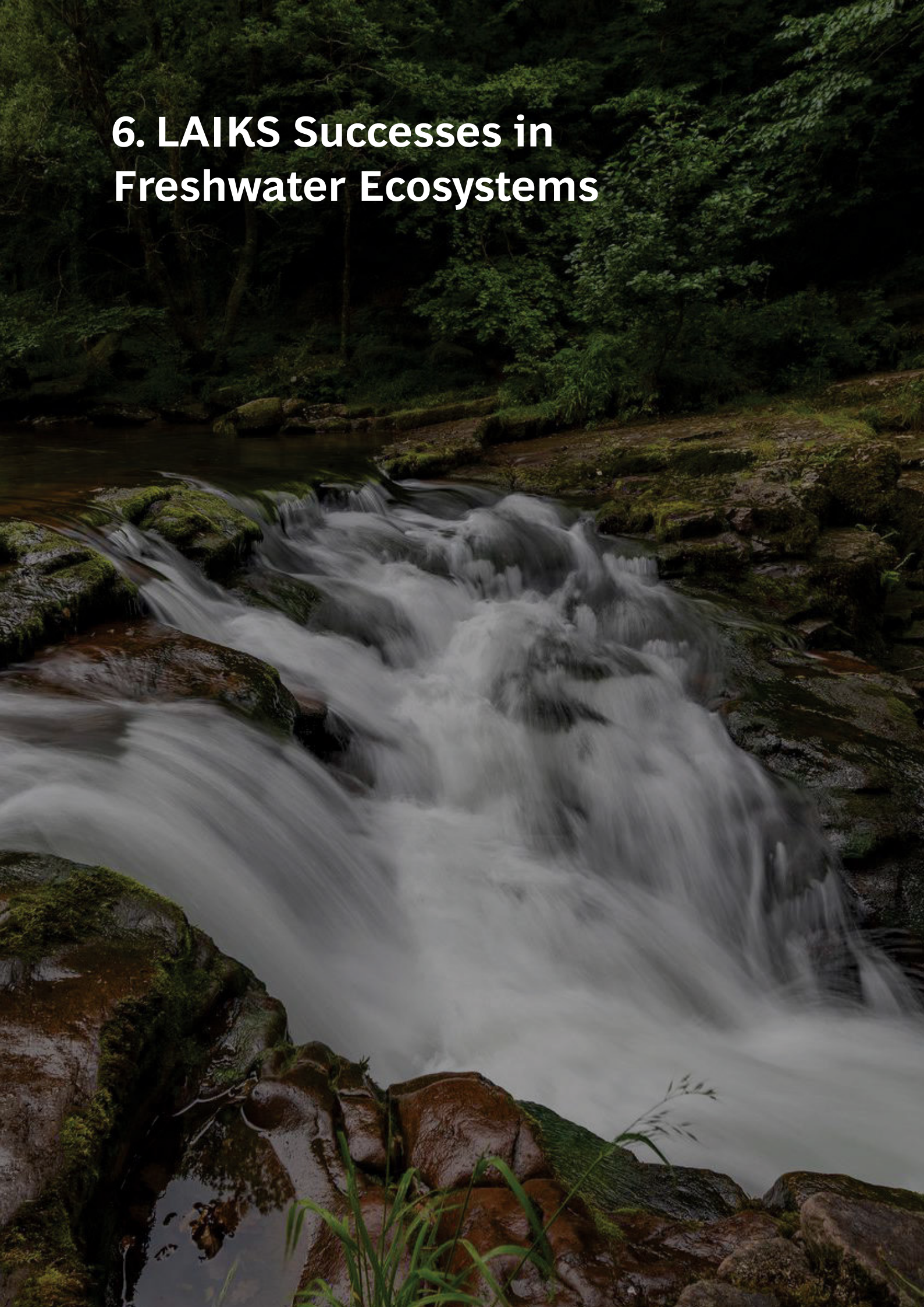
[24] Brazil Restoration & Bioeconomy Finance Coalition launched at G20 Summit, G20 Global Land Initiative, United Nations Convention to Combat Desertification, Nov. 22, 2024

[25] Funding with Purpose Report, Rainforest Foundation Norway, 2022

- Ensure Indigenous voices are included in funding decisions.
- Promote transparent, inclusive financial governance and frameworks.

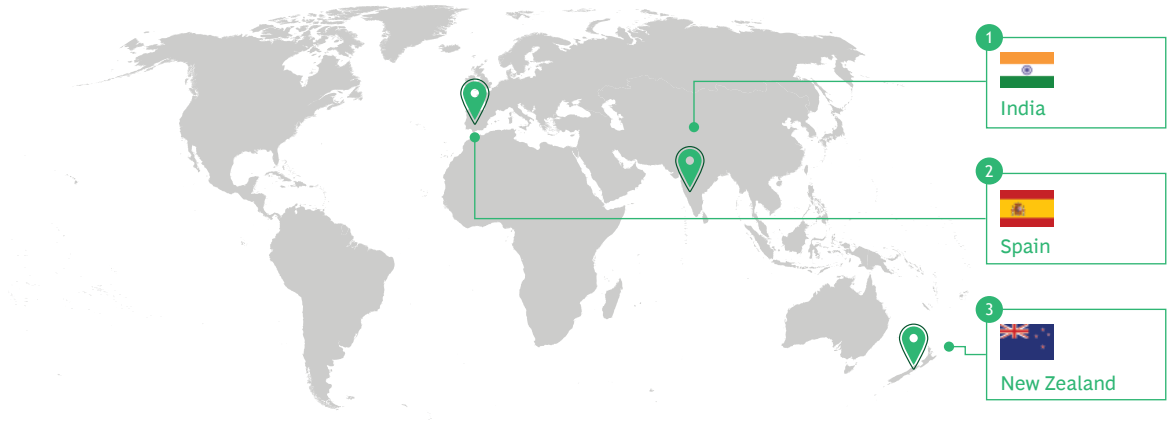
Because structural changes can take time, accelerating the establishment of a nature credit market can create immediate value. Natural resource protection demands increased financial support, but resources are finite. Developing a credible nature credit market led by IPLCs could address that. Such a market would align with global climate goals while channeling resources directly to those in the best position to safeguard biodiversity. An IPLC-led credit mechanism rooted in hyperlocal stewardship would ensure fair recognition and resourcing of Indigenous efforts. A bottom-up model anchored in Indigenous knowledge systems would offer stronger potential for lasting impact and more effective restoration outcomes.

6. LAIKS Successes in Freshwater Ecosystems



To illustrate the positive outcomes LAIKS can create, we analysed how communities in three different countries-India, Spain, and New Zealand-applied them to improve freshwater ecosystems, which are vital to IPLCs. Each example illustrates how key actions were put into practice, offering valuable lessons for how to address challenges in diverse settings. In addition to providing the details for the solutions, we explain how each incorporated coalition building, knowledge foundation, and financial access. (See Exhibit 5.)

Exhibit 5: Freshwater Resilience Solutions Rooted in LAIKS are Present Worldwide



Source: BCG analysis.

INDIA: 'City of 1,000 Tanks' Project Brings Back Ancient Water Management

The city of Chennai in the Indian state of Tamil Nadu once relied on a 1,000-year-old system of temple tanks, lakes (erys), and rivers to capture monsoon rains and recharge aquifers to sustain people through droughts and seasonal floods. Eventually, modern infrastructure and urban development overtook the old system. But as the city grew, civic water systems couldn't keep up. Monsoons caused major floods and damage. Even though annual rainfall exceeded demand, most rain and wastewater was discharged into the sea. The city came to depend on expensive desalination systems for water, and a significant portion of its sewage went untreated, contaminating rivers and aquifers. The water crisis forced Chennai to go back to its roots and adopt a traditional, nature-based water management system that integrates with modern eco-technologies26. For the City of 1,000 Tanks project, Chennai worked with local organisations such as the Care Earth Trust to restore wetlands, and local architects Madras Terrace to restore historic temple tanks for groundwater recharge. The new system filters water naturally, has a low carbon footprint, and doesn't require concrete.

If all goes according to plan, the city-wide network will capture and clean stormwater, treat wastewater, and recharge aquifers, which will help reduce drought risk and urban flooding-turning water from a scarce commodity to a sustainable asset. The nature-based solution will benefit

[26] The 'City of 1,000 Tanks' project is Chennai's first collaborative water alliance led by OOZE architects and urbanists with Madras Terrace, IIT Madras, Care Earth Trust, Eco Village International, Atma Water, IRCDUC, Uravugal Social Welfare Trust, Paperman Foundation, Rain Centre, TU-Delft, HKv, Goethe Institute, Chennai Resilience Centre and others. The project is funded by the Government of the Netherlands under the Water as Leverage program.

the area financially as well, with 34% cheaper capital expenses, and 89% lower operating costs than those for running desalination plants, and a total water cost to society of $651 million a year compared with $1.S billion a year under a business-as-usual scenario.

Coalition building. The City of 1,000 Tanks project saw experts on international urban and cultural architecture and water resource management from OOZE Architects and the Dutch government collaborate with local knowledge holders. Representatives from vulnerable settlements in the city helped define the problem with assistance from the Uravugal Social Welfare Trust and the Information and Resource Centre for the Deprived Urban Communities. Marginalised communities also helped test solutions, including the Little Flower Convent school, which serves a population that is especially vulnerable to the effects of drought, flood, and groundwater pollution. The school, which is sits on a former reservoir structure, piloted a new water balance system to demonstrate how such a system could be scaled.

Foundational knowledge. The water management project was built on the mutual exchange of knowledge. A group of water ambassadors helped raise awareness of the project in the community and trained residents to identify issues, ensuring that local knowledge informed project design. A related “Waler Matters” program used Tamil language, folk art, and theatre to communicate technical concepts and ensure that engagement activities were culturally appropriate. Resident associations and local businesses helped implement, pilot, scale, and govern the project, ensuring it was community led.

Financial access. The project shows how LAIKS-based solutions can be cost effective scalable water-security options for resource-constrained communities. Implementing a system of temple tanks and wetlands with a low carbon footprint and minimal operating costs demonstrated that a nature-based solution can be an affordable alternative to more expensive desalination systems. International partners helped secure funding for community-based pilots. Making

rather than spending a massive amount of capital upfront reduced financial barriers.

SPAIN: Reviving the Acequia Water Network to Combat Drought

Extreme heat and erratic rain threaten rural livelihoods in southern Spain, one of Europe's most drought-prone areas. As droughts intensify the issue, local groups and other stakeholders have sought to address it by resurrecting a network of ancient acequia canals buried under years of neglect.

The acequia network of 1,800 miles of earthen canals that cross the Sierra Nevada mountain range in Spain's Andalusia region dates back 1,000 years, making it one of Europe's oldest water management systems. Acequias captured mountain snowmelt and rainfall and distributed water to terraced fields, orchards, and villages. For centuries, the water helped crops flourish and supported agrarian communities. But by the mid1900s, the network fell into disuse when water infrastructure was modernized and people left rural areas, taking knowledge of the system with them.

Water's growing scarcity renewed interest in the acequias as a nature-based solution for climate adaptation. Restoring the acequias provided reliable water supplies to upland villages, enhancing drought resilience. The network stores winter runoff underground, boosting dry-season streamflow and sustaining irrigation, springs, and wells. The canals are low-tech, adaptable, and resilient, and aquifer recharge and enhanced soil moisture mitigate drought and reduce downstream flood risk. Local labor and materials were used to restore the canals, reducing financial, energy, and carbon costs, and bypassing the need for large-scale infrastructure engineering. The restored acequias now deliver measurable climate adaptation benefits. The environmental benefits combined with the economic value the system produces exceeds close to $26 million a year while operating costs amount to slightly less than $50,000, demonstrating its high financial and social profitability.[27]

Coalition building. Local farmers, volunteers, and researchers are collaborating on projects to excavate and repair the channels. One project, an EU-funded collaboration between the University of Granada and local authorities, has restored 14 ancient canals and rehabilitated dozens more. Communities take part in "acequia cleaning" days each spring, clearing debris and sediment. The annual cleaning days are more than restoration work: they are community rituals that strengthen collective stewardship of shared water. The multistakeholder coalition is led by those closest to the land, while the EU funded partnership helps sustain cooperation.

Foundational knowledge. Researchers worked alongside farmers and community elders to document and revive foundational knowledge of the acequias, preserving centuries-old practices that had almost disappeared. This included reviving the traditional community governance for managing shared water rights and resolving allocation disputes, systems that had proven effective over centuries of scarcity. The governance system relies on local knowledge of needs and seasonal patterns, as well as on community cohesion and trust. As models of "governing the commons," the systems also represent a crucial part of the local cultural heritage.

Financial access. EU funding supported community-led restoration. By using local labor and materials, the project reduced costs while keeping resources within the community, and avoided imposing large-scale engineered infrastructure that local farmers and community members did not believe would benefit the region. Moreover, the funding model recognized and supported the value of traditional governance systems, allocating funding to strengthen traditional community institutions rather than introducing external management structures.

[27] W. Vargas, Economic Valuation of Ancestral Artificial Aquifer Recharge Systems in High Mountain Environments of Sierra Nevada, Spain, Water, 2025

By recognizing that traditional water management systems incorporate sophisticated governance, technical knowledge, and social cohesion are built into, the project shows how LAIKS provide resilient, equitable solutions to contemporary challenges. The initiative was successful not just because it restored infrastructure, but because it helped revitalize community institutions that sustain collective stewardship of shared resources. The approach offers a replicable model for other drought-prone regions, showing that it's possible to build climate resilience by combining external funding and academic support with local leadership, traditional governance, and ancestral ecological knowledge.

NEW ZEALAND: Applying Maori Philosophy Management to Improve Water

New Zealand faced serious water management challenges from aging infrastructure, underinvestment, and underappreciation for native Māori values of guardianship and respect for treasured resources. The country's practice of separately managing drinking water, wastewater, and stormwater systems was outdated, and assumed limitless resources and nature's ability to handle pollution.

By 2000, 20% of the country's treated water was being lost to leaky pipes – a number that increased to more than 50% in some areas. One in five people received substandard drinking water. Only 27% of sewage treatment plants complied with discharge consents, and during heavy rains, sewage overflow polluted beaches and rivers.

The scale of the crisis became undeniable when, in August 2016, the water supply in the town of Havelock North became contaminated, causing residents to fall ill, and a number of deaths to be linked to a related gastroenteritis outbreak. Untreated water was determined to have been pumped into homes, and a government inquiry revealed compliance failures. Responding to the outbreak cost at least $21 million on top of the $12.5 million to $23. 75 million in costs the country incurred every year due to illness and lost productivity related to overall water non-compliance issues.

The social and economic fallout that ensued led to comprehensive action. As part of the effort, the country adopted a water management approach rooted in the Māori philosophy of *'Te Mana o te Wai,"* treating water as a vital living treasure. Traditional Māori knowledge and values were embedded into freshwater reforms, regulations, and policy frameworks.

Coalition building. The new system was built on institutionalized governance structures that saw regional councils and water planners partner with local iwi, or tribes, and hapū, sub-tribes, so water project goals reflected local values. In practice, it meant including Māori-led environmental monitoring, using cultural health indicators for waterways, and incorporating Indigenous practices such as riparian planting with native species significant to the tribes.

Under the reforms, a co-governance structure was split 50-50 between councils and tribes, and subtribes, with co-chairs leading governance bodies and regional representative groups ensuring that Māori were equally represented in decision-making. The government developed explicit partnership principles, including "Build the relationship before focusing on the work," and "Plan together from the start." Māori advisory groups were established to facilitate crown-Māori partnerships across the increasingly complex landscape of water, health, and local reforms.

Foundational knowledge. Indicators of water delivery quality and ecosystem health are now based on Māori cultural touchstones as well as Western scientific metrics, creating a dual knowledge system where both ways of understanding inform decision-making. Significant resources support iwi and Māori capacity development across governance, management, and technical disciplines, recognizing that meaningful knowledge exchange requires investment in capability building.

Financial access. The project has attracted commitments of $69 billion to $106 billion in investments over a 30-year period to upgrade infrastructure and restore resources in order to make waterways and aquifers healthier, which will deliver safer drinking water and cleaner

beaches. The reform's public ownership structure, with the incremental investments at the community level council shareholding on behalf of communities, protects against privatization by requiring unanimous council support and a 75% public majority to divest assets. Critically, all Māori involvement is funded by water users and ratepayers, acknowledging that meaningful partnership requires financial support rather than relying on volunteer effort.

The early results of the changes are visible. Over time, they are expected to reduce sewage overflows, improve river quality, and return traditional food gathering to places where it had been lost. Māori communities experience greater stewardship and inclusion in managing resources that are spiritually significant to them, while non-Māori are increasingly embracing shared values.

The Havelock North disaster exposed how water management divorced from Indigenous guardianship failed both public health and environmental protection. By institutionalizing Māori co-governance, knowledge systems, and funded participation, the country is building a water infrastructure that serves both cultural values and public health. The model shows that effective climate adaptation and resource management require not just technical solutions but fundamental shifts in governance that restore Indigenous peoples' authority over resources they have stewarded for generations.

7. Call to Action

Adopting local and hyperlocal solutions and engaging with local communities can help address the world's ongoing environmental and social challenges. Integrating LAIKS into the process can help create local solutions that are relevant and resilient. The following key considerations can establish effective partnerships toward that goal:

Take collective, ethical action. Foster collaborations across public, private, and civil society to build networks and ensure resources are governed effectively.

Build coalitions early to ensure that both technical experts and affected communities share decision-making power. For impacts to last, prioritize shared ownership, local engagement, and mutual accountability.

Acknowledge the value of nature. Recognize that alternative development paradigms exist. Integrate nature and stewardship into societal systems to enhance environmental and social outcomes.

Blend local knowledge with modern science. Incorporate LAIKS, modern science, and technology equally through inclusive partnerships. Create platforms for knowledge exchange where traditional ecological knowledge informs modern design and embracing local culture makes technical concepts accessible. Recognize and uphold diverse worldviews to reveal scientific blind spots and enable adaptive, locally appropriate solutions. Invest in capacity to bridge knowledge systems. If appropriate, embed Indigenous principles in legislation and institutions, and create genuine power-sharing structures.

Provide access to funding. Align financing with local and Indigenous-led priorities. Structure financing to support the soft infrastructure of community engagement, not just physical systems. Streamline funding flows to reduce bottlenecks and unlock high-impact solutions that can meet urgent environmental and social challenges.

Make delivery scalable. Expand proven models to catalyse systemic transformation by enabling context-sensitive localization. Empower smallerscale initiatives to replicate and tailor models to their specific environments. When all the elements are aligned, a pilot project that serves 500 people can demonstrate pathways to securing water for millions.

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For the wellbeing of the planet and people everywhere-both Indigenous and nonIndigenous-current systems must change. LAIKS represent an alternative way of knowing and acting in the world and have much to offer organizations working on solutions to address environmental challenges.

Indigenous and non-Indigenous parties can work together in ways that are mutually supportive and recognized. A localized approach can be highly effective in reaching these communities. Solutions designed by and for Indigenous peoples that are tailored to their needs and perspectives often benefit broader populations as well.

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