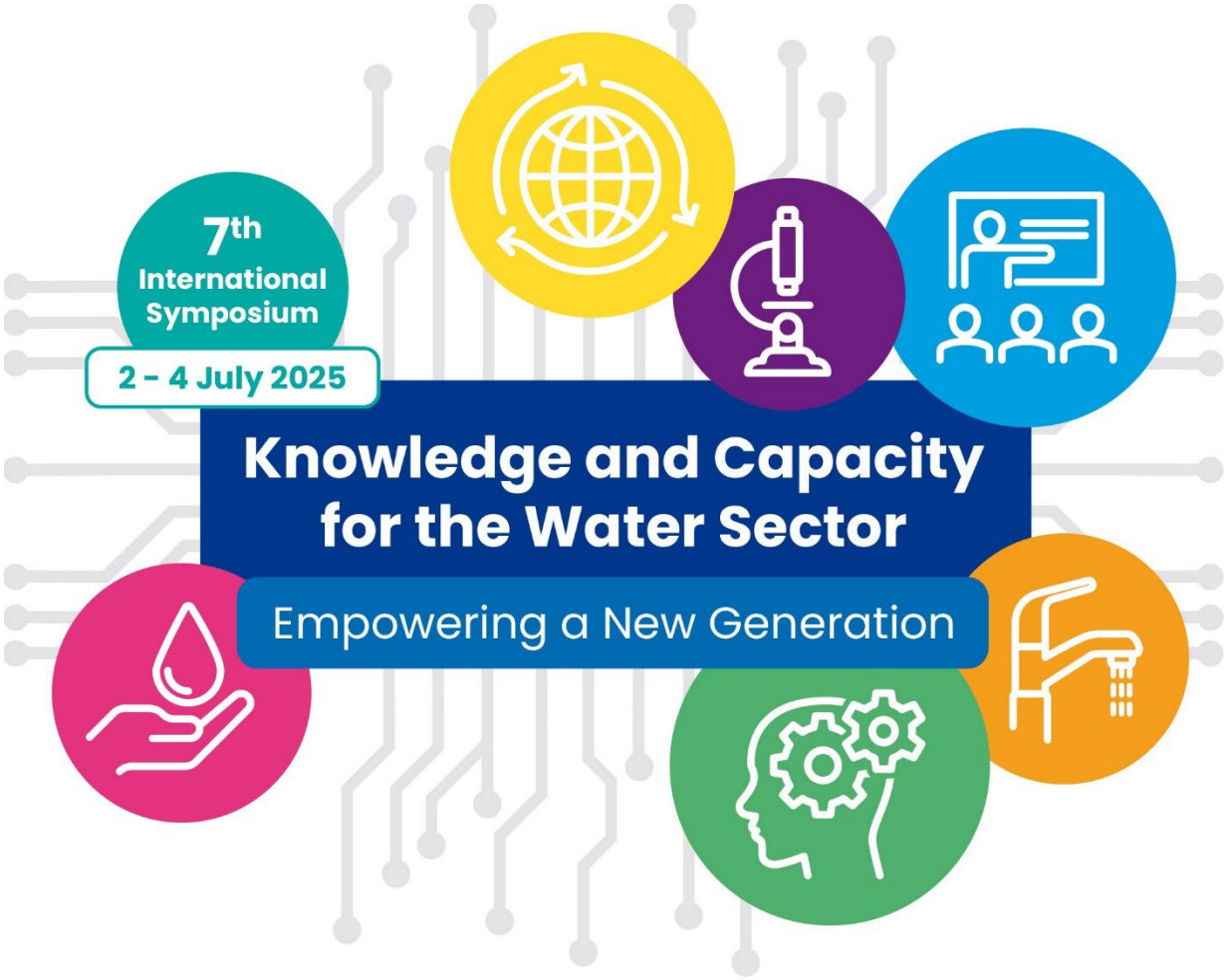

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Landscape-based Solutions (LBS) for Bio-Cultural Diversity

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SUMMARY
This research explores landscape-based solutions (LBS) as an integrated, transdisciplinary approach to address the interlinked challenges of climate change, biodiversity loss, and water insecurity. LBS aim to regenerate living landscapes by combining ecological science, indigenous knowledge, and spatial design. Rooted in local conditions—such as climate, ecology, water, and cultural history—LBS support inclusive, multifunctional landscapes that enhance both ecological resilience and social equity. Using a mixed-methods approach, the study combines global mapping of Indigenous and Traditional Ecological Knowledge (IEK/TEK), a survey of practical LBS applications, and engagement in real-time landscape projects in Indonesia, the Netherlands, and Germany. A cross-case analysis reveals diverse strategies and shared success factors, including grounding in local systems, strong community involvement, and adaptive, multi-scalar design. The ultimate goal is to influence global water governance by demonstrating the value of integrating ancestral knowledge into contemporary landscape strategies. In alignment with the Sustainable Development Goals—especially SDG 6 (Clean Water and Sanitation), SDG 13 (Climate Action), and SDG 15 (Life on Land)—this research promotes ecologically sound and culturally rooted solutions. It contributes to a transferable framework for sustainable landscape planning in both urban and rural contexts.

INTRODUCTION

In the face of accelerating climate change, biodiversity loss, and increasing water insecurity, landscape-based solutions (LBS) offer a transdisciplinary, systems-oriented approach to designing inclusive, adaptive landscapes (Nijhuis, 2024). Rather than treating ecological and social systems separately, LBS focus on co-creating and regenerating living landscapes in which biocultural diversity, indigenous knowledge, and multifunctionality drive both ecological resilience and social equity.

The objective of this research is to develop and test LBS as an integrated framework that bridges indigenous knowledge, ecological science, and spatial design. LBS build on long-term natural dynamics, socio-cultural values, and the inherent logic of landscape—understanding how form, function, and meaning evolve over time. They operate across scales and timeframes and are grounded in local conditions such as climate, soil, water, culture, and history. The aim is to support planners, designers, and decision-makers with a transferable, context-sensitive framework applicable in both urban and rural settings.

Indigenous and traditional ecological knowledge (IEK/TEK) offer deeply place-based insights into sustainable land and water management, shaped by generations of observation, adaptation, and stewardship (Berkes, 2018).

The ultimate goal is to influence global water governance by demonstrating the value of integrating ancestral knowledge into contemporary landscape strategies. In alignment with Sustainable Development Goals—particularly SDG 6 (Clean Water and Sanitation), SDG 13 (Climate Action), and SDG 15 (Life on Land)—this research promotes sustainable, culturally rooted water management. In addition, it contributes to the implementation of the Global Biodiversity Framework (UNEP FI, 2023) by advancing inclusive, place-based conservation and restoration practices.

METHODOLOGY

This research employs a mixed-methods approach, structured around three core activities:

1. **Mapping indigenous and traditional ecological knowledge (IEK/TEK)**

A global survey documents and maps indigenous and traditional practices for water management, ecological stewardship, and climate adaptation, focusing on place-based environmental knowledge systems to highlight context-specific characteristics and solutions. This includes historical mapping, interviews and community-led documentation of traditional practices. A comparative analysis of the practices reveals underlying principles and transferable insights for contemporary landscape-based approaches.

2. **Survey and analysis of landscape-based solution (LBS) applications**

An overview is compiled of practical applications of landscape-based solutions in the fields of biodiversity, water management, agriculture, and social inclusion. A comparative analysis identifies key success

factors and underlying planning and design principles across diverse contexts.

3. Engagement in real-time landscape development projects

Landscape-based solutions are implemented and tested in real-time through active engagement in diverse landscape projects. These include community-based ecological mangrove restoration in East Kalimantan (Indonesia), the development of climate adaptive historical estate landscapes in Gelderland (Netherlands), and landscape-based and water-sensitive regional design in sandy regions such as Overijssel (NL) and Niedersachsen (DE).

These core activities are supported by a range of complementary research methods, including literature reviews, and case studies for descriptive and analytical insight; the development of typologies to enable systematic comparison of LBS approaches; participatory action research through co-design workshops (figure 1) and community engagement; and design-as-research strategies such as spatial scenario building and iterative design processes.

Figure 1: Co-design workshop during Biodiversity COP 2024

RESULTS & DISCUSSION

An initial catalogue of landscape-based solution (LBS) practices has been developed, featuring examples of ethnobotany, ecosystem management, water regulation, and climate adaptation. These practices are organized by climate zone—tropical, semi-arid, and temperate—to highlight context-specific characteristics and locally rooted solutions.

Applications of these traditional and indigenous practices reveal a rich diversity of approaches that integrate ecological restoration, water management, and community participation. This diversity underscores the potential of such practices to address contemporary environmental and societal challenges in context-specific and culturally grounded ways. Examples include:

- *Tropical region:* In the Jaguar Corridor of northern South America, landscape initiatives combine forest regeneration, nature protection, the safeguarding of sacred spaces, and the support of local livelihoods.
- *Semi-arid region:* On China's Loess Plateau, large-scale reforestation and soil retention efforts have reversed decades of degradation, improved water retention, and revitalized agricultural productivity.
- *Temperate sandy region:* In the eastern Netherlands, landscape-based groundwater recharge systems are integrated with biodiversity development, sustainable agriculture, and urban green-blue infrastructure.

A cross-case analysis of these examples highlights several common elements of success:

- Grounding design in the specific characteristics of local landscape systems (climate, soil, hydrology)
- Integrating Indigenous and Traditional Ecological Knowledge (IEK/TEK)
- Establishing strong co-creative processes involving local communities, practitioners, and experts
- Employing design strategies that are adaptive, multi-scalar, and responsive to long-term change

Nonetheless, significant challenges remain. These include institutional resistance to non-Western governance models, the risk of tokenistic inclusion of traditional knowledge, and difficulties in scaling place-based approaches within formal legal and planning systems.

Despite these challenges, LBS approaches show strong potential to advance multiple Sustainable Development Goals—particularly SDG6, SDG13, SDG 15—and contribute meaningfully to the implementation of the Global Biodiversity Framework.

CONCLUSIONS

Landscape-based solutions represent a robust and adaptive strategy for designing resilient, water-sensitive, and culturally grounded landscapes. By combining ecological processes with social systems and spatial design, LBS help restore degraded environments while empowering communities.

This research contributes to the development of a landscape-based, multi-scale design and planning framework. It supports planners, designers, and decision-makers with context-specific strategies, design principles, and indicators that bridge traditional knowledge, ecological science, and participatory design. As real-time projects continue, the evolving framework seeks to influence global water governance and landscape policy through grounded, actionable, and inclusive approaches.

REFERENCES

F. Berkes (2018) *Sacred Ecology*. Londen, etc.: Routledge.

S. Nijhuis (2024) *Landscape Logic*. Prinsenbeek: Jap Sam Books.

UNEP FI (2023) *Global Biodiversity Framework*