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STRENGTHENING SCIENCE — POLICY INTERFACES FOR COHERENT AND SUSTAINABLE LAND USE

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INTRODUCTION

Land systems today face accelerating pressures from agricultural expansion, infrastructure development, biodiversity loss, and climate change. With nearly 70% of terrestrial surfaces under active use and roughly 20% already degraded, societies must navigate trade-offs between food production, ecosystem protection, and climate action.[1] Global frameworks such as the Rio Conventions and the Sustainable Development Goals attempt to provide integrated responses to these interconnected challenges[2], but implementation often falters because governance systems remain fragmented.[3] Ministries frequently operate in isolation, sectoral mandates conflict, and coordination between global, national and subnational levels is weak.[4] As a result, interventions designed to improve land-use outcomes may inadvertently undermine progress elsewhere, reinforcing rather than reducing trade-offs across land, climate, and biodiversity goals.[5]

Science–Policy Interfaces as Pathways Toward Policy Coherence

Science–policy interfaces (SPIs) have emerged as important mechanisms for helping policymakers navigate complex challenges, understand cross-sector interactions, align competing priorities, incorporate diverse knowledge systems, and adopt evidence-based approaches to land-use governance.[6] SPIs provide platforms for scientists, practitioners, policymakers, and other stakeholders to co-produce knowledge, deliberate on evidence, and devise policy options with implications for land-use decisions, ultimately serving as intermediaries.[7] However, their influence depends strongly on institutional design, political contexts, collaboration between organizations, and the strength of cross-scale knowledge flows. Across several studies, three themes consistently emerge regarding how SPIs can better support coherent and sustainable land-use decision-making.

First, institutional design profoundly affects whether SPI-generated knowledge is used in policymaking. Bodies that are small, inclusive, and embedded within their policy context, such as the Science-Policy Interface of the UN Convention to Combat Desertification, tend to foster more iterative exchange between experts and policymakers. Features such as practitioner involvement, regular engagement with negotiators, transparent review cycles, and formalized spaces for interaction help maintain credibility and relevance while enhancing opportunities for expert input to shape political debates. However, evidence use ultimately depends on political timing: even well-designed SPIs can influence outcomes only when "windows of opportunity" open and when scientific insights align with shifting policy agendas.[8]

Second, while global environmental challenges are interconnected, the broader landscape of global SPIs and associated institutions governing these challenges is characterized by fragmentation. Mapping collaboration across 41 global environmental SPIs shows an extensive but highly fragmented network, structured by organizational mandates and bureaucratic boundaries more than by cross-cutting problem-solving needs.[9] Collaboration does occur, but it often depends on personal relationships rather than institutionalized mechanisms, limiting its consistency and durability. Divergent priorities, uneven resources, and competing political pressures all constrain institutional cooperation. Yet collaboration remains critical: when SPIs coordinate their communications, develop joint assessments, and adopt shared work programs, they reduce duplication of efforts, integrate diverse knowledge systems, and provide more coherent guidance on cross-sector land-use issues such as land degradation, climate change, food insecurity, and biodiversity loss. Strengthening such collaboration is essential for addressing the epistemic and institutional complexity of global environmental governance.

Third, national-level SPI networks, particularly in the Global South, play a pivotal but often under-recognized role in shaping how knowledge is co-produced and used within local governance contexts. Kenya, for example, illustrates both the promise and challenges of SPIs embedded in polycentric governance systems. Devolution has diversified decision-making across 47 counties, national agencies,

research institutions, and civil society organizations. This has increased opportunities for context-specific knowledge to inform planning on climate adaptation, biodiversity conservation, and sustainable land management. Domestic experts and technical officers frequently act as knowledge brokers, translating complex issues into actionable policy options. Yet fragmentation across ministries, resource inequalities, and mismatches between national and county priorities hinder coherent implementation. Moreover, global environmental assessments such as those of the IPCC and IPBES often remain distant from local policymaking because their framing, scale, or relevance does not align with national political agendas or lived realities. As a result, informal relationships, rather than formal structures, often determine whether knowledge circulates across levels of government.

Toward Integrated and Inclusive Land-Use Governance

Collectively, these studies show that strengthening SPIs requires more than producing high-quality science. Effective science–policy engagement depends on institutionalized interaction, trust-based relationships, cross-organizational collaboration, and mechanisms that allow a two-way knowledge flow between global, national, and local scales. It also underscores that land-use governance is inherently political, as evidence is interpreted within contested landscapes of power, values, and competing priorities rather than standing on its own.[10] SPIs can meaningfully support policy coherence when they help actors navigate these tensions by clarifying trade-offs, exposing unintended consequences, and identifying synergies that might otherwise remain invisible. They can also help ensure that diverse voices, including Indigenous Peoples, local communities, practitioners, and Global South experts, shape assessments and policy design.[11]

To realize these benefits, the studies suggest that SPIs could be more effective when they are better equipped and more interconnected. Institutional design that facilitates participation, deliberation, and reflexivity,

rather than relying solely on linear or technocratic models, appears to support richer science–policy engagement. The findings also highlight the value of more systematic collaboration among global SPIs to bridge sectoral silos and provide more integrated guidance. At national levels, strengthening brokering capacities can help ensure that cross-scale knowledge is interpreted and applied in ways that resonate with local priorities. Taken together, these insights point to opportunities for SPIs to enhance their contribution to land-use governance in contexts characterized by deep uncertainty and complexity.

Policy Recommendations

- **Enhance SPI institutional design** by ensuring inclusive membership, establishing regular and structured engagement between experts and policymakers, enabling small and agile expert groups, and embedding iterative review mechanisms that support learning and adaptation.
- **Strengthen collaboration across global SPIs** through joint work programs, shared communications strategies, and dedicated resources for coordination to reduce duplication and provide more coherent cross-sector policy guidance.
- **Build knowledge brokering capacity at national and subnational levels**, including training brokers within ministries, empowering domestic research institutions, and supporting multi-stakeholder platforms that contextualize scientific findings for local decision-making.
- **Improve alignment between global assessments and national policy needs** by enhancing representation of Global South experts (particularly African) in assessment processes, developing regionally tailored outreach materials, and establishing channels for two-way knowledge exchange that allow local insights to shape global science.
- **Promote cross-sectoral policy coherence** by applying co-produced knowledge from SPI outputs to assess trade-offs and synergies, and aligning agricultural,

environmental, climate, and land-use strategies under shared frameworks.

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