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Integrative Frameworks in Global Multidisciplinary Research: Bridging Science, Technology, Social Systems, and Sustainable Development

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Abstract
Contemporary global challenges—from climate change and public health crises to digital transformation and social inequality—exhibit unprecedented complexity that transcends traditional disciplinary boundaries. Despite decades of advocacy for interdisciplinary approaches, research and policy communities remain largely fragmented, producing siloed knowledge that fails to address the interconnected nature of real-world problems. This review article examines integrative multidisciplinary research frameworks that systematically bridge science, technology, engineering, social systems, and sustainable development. Drawing on systems theory, socio-technical integration models, and convergence research paradigms, the article analyses conceptual frameworks that enable translational research and evidence-based policy formation. Key frameworks examined include the SSPT (System-Social-Process-Tooling) framework for managing complexity in multidisciplinary design, Fuzzy SETS (Social-Ecological-Technological Systems) for acknowledging multiple epistemological perspectives, and the Sustainable Public Innovation Ecosystem model for governance integration. The article explores applications across climate resilience, digital infrastructure, public health, and sustainable urban development, demonstrating how cross-sectoral collaboration produces measurable sustainability outcomes. Implementation models are evaluated through the Global Impact Analytics Framework and Technology Readiness Levels adapted for implementation science. Three comparative tables synthesise framework characteristics, sectoral applications, and implementation considerations. Findings indicate that successful multidisciplinary integration requires not merely technical interoperability but epistemological pluralism, institutional adaptability, and governance mechanisms that bridge global policy frameworks with local implementation contexts. The article concludes that integrative frameworks represent essential infrastructure for achieving the Sustainable Development Goals and recommends institutional reforms to support transdisciplinary collaboration, data governance, and evidence-based policy translation.

Keywords: Multidisciplinary Systems Integration, Sustainable Development Frameworks, Technology-Policy Interface, Socio-Technical Systems, Evidence-Based Governance, Digital Transformation in Sustainability, Global Research Convergence

1. Introduction

The defining challenges of the twenty-first century—climate change, pandemic preparedness, digital transformation, sustainable development, and social inequality—share a fundamental characteristic: they refuse to respect disciplinary boundaries. Climate change is simultaneously an atmospheric physics problem, an engineering challenge, a public health emergency, an economic dislocation, and a matter of social justice. Digital transformation involves not only computer science but also institutional redesign, ethical governance, labour market restructuring, and educational system adaptation. These challenges demand responses that integrate knowledge across the natural sciences, engineering, social sciences, and humanities [2, 6].

Yet the dominant organisation of research and policy-making remains stubbornly fragmented. Universities are structured into disciplinary departments. Funding agencies operate through thematic silos. Government ministries address portfolios such as health, environment, or industry in isolation. This fragmentation produces what might be called the 'integration paradox': while the problems requiring solutions are increasingly interdisciplinary, the institutions designed to address them are not [3, 4]. The result is a persistent gap between the production of disciplinary knowledge and the translation of that knowledge into effective action on complex global challenges.

The limitations of discipline-fragmented models have become increasingly apparent. Climate adaptation strategies developed without community input fail to address local vulnerabilities [6]. Public health interventions designed without consideration of digital infrastructure cannot leverage real-time data for early warning [6]. Smart city initiatives driven by technology companies without social science engagement reproduce urban inequalities [4]. These failures are not merely implementation shortcomings; they reflect a deeper inadequacy in how knowledge is produced and organised.

This article addresses the critical need for integrative multidisciplinary research frameworks that systematically bridge science, technology, engineering, social systems, and sustainable development. Such frameworks are not simply about bringing different disciplines into conversation; they require structured methodologies for integrating knowledge across epistemological differences, aligning research with policy processes, and translating findings into implementable solutions [2, 8]. The urgency of this task is underscored by the Sustainable Development Goals (SDGs), which explicitly recognise the interconnectedness of economic, social, and environmental objectives and call for integrated approaches to their achievement [3, 10].

The objectives of this article are threefold: first, to examine conceptual and methodological frameworks for multidisciplinary integration that have demonstrated utility in research and policy contexts; second, to analyse applications across key global domains where integrative approaches are producing measurable outcomes; and third, to synthesise implementation models, evaluation metrics, and institutional requirements for scaling multidisciplinary research. The article adopts a research-review hybrid methodology, drawing on recent scholarly literature and implementation case studies to develop a structured analysis of integrative frameworks and their translational potential.

2. Conceptual and Methodological Frameworks for Multidisciplinary Integration

2.1. Systems Theory and Socio-Technical Integration Models

Systems thinking provides the foundational logic for multidisciplinary integration. By conceptualising problems as interconnected systems with multiple interacting components, feedback loops, and emergent properties, systems approaches inherently demand consideration of technical, social, and environmental dimensions simultaneously [1, 8]. The social-ecological-technological systems (SETS) framework exemplifies this integrative logic, explicitly recognising that contemporary challenges cannot be adequately understood through any single lens [8].

Recent advances in SETS theory have grappled with a fundamental challenge: how to acknowledge that elements within these systems may simultaneously belong to multiple categories. The Fuzzy SETS framework addresses this by drawing on mathematical fuzzy set theory to treat social, ecological, and technological categories as capable of multiple memberships [8]. This conceptual innovation is particularly important for transdisciplinary research teams, where diverse epistemological perspectives may categorise the same element differently. In applying Fuzzy SETS to watershed management in New Mexico, researchers found that explicitly acknowledging multiple memberships enabled deeper questioning of system dynamics and enriched collaborative modelling [8]. The framework thus addresses not only technical integration but also the epistemological pluralism essential for genuine multidisciplinary collaboration.

Complementing SETS approaches, the SSPT framework developed by Garza Morales examines four key dimensions of complexity in multidisciplinary system design: System, Social aspects, Process, and Tooling [1]. Within these dimensions, the framework identifies five critical challenges in complexity management: System Alignment, Process-Social Alignment, Tool-Social-System Process Alignment, Social-System Alignment, and System-Process Alignment. The least explored of these—System-Process Alignment—plays a crucial role in ensuring coherence between system architecture and engineering processes. To address this, the InDexign tool leverages visual storytelling to improve information sharing across engineering teams, demonstrating how participatory design methods can facilitate multidisciplinary collaboration in industrial contexts [1].

2.2. Convergence, Transdisciplinarity, and Interepistemic Approaches

The terms convergence research, transdisciplinarity, and team science are often used interchangeably, yet they represent distinct traditions with different epistemological commitments. The Transformation Network, a National Science Foundation-supported Sustainable Regional Systems Network, has developed an approach that explicitly integrates two schools of transdisciplinary thought: the metaphysical approach of the Nicolescuian School, which emphasises the emergence of new knowledge at the interfaces between disciplines, and the solution-focused Zürich School, which prioritises stakeholder engagement and real-world problem-solving [2].

What distinguishes the Transformation Network's approach is its commitment to interepistemic and interontological engagement—building across different knowledge systems both within academia and among Native American and community partners [2]. This goes beyond conventional interdisciplinary research, which typically operates within Western scientific paradigms, to acknowledge that Indigenous knowledge systems, community expertise, and practitioner wisdom represent valid and distinct ways of knowing that can enrich scientific understanding. Operationalising this approach requires systems thinking, systems dynamics modelling, and sustained attention to community engagement, diversity, equity, inclusion, and justice [2].

The practical application of this framework is evident in partnerships with Navajo Nation members to support the independence of Native American communities in the San Juan River Watershed through small-scale sustainable offgrid food-energy-water systems [2]. This example illustrates how interepistemic approaches can produce solutions that are simultaneously technically sound, culturally appropriate, and community-owned.

2.3. Data-Driven and Digital Integration Platforms

The digital transformation of governance and research has created unprecedented opportunities for multidisciplinary integration. Integrated ICT platforms now enable the collection, analysis, and visualisation of data across sectors, supporting evidence-based policy formation and monitoring [3, 10]. The platform developed in Italy's Puglia Region exemplifies this potential, creating a geo-database that collects regional regulatory data on SDGs, cooperation projects, and technical and scientific documents to support sustainable development policies [3, 10].

This platform, developed entirely with open-source software, facilitates collaboration between legislative institutions and research centres, enabling the transfer of data and best practices to support political decisions [3]. By mapping relevant projects and monitoring progress, it represents an important resource for sharing information between local, national, and European actors. The platform's design reflects growing recognition that effective sustainability governance requires systemic perspectives rather than single-objective approaches, and that integrated multi-governance frameworks are essential for implementing the SDGs across different territorial contexts [3].

The Climate-Smart Public Health framework similarly leverages data science and artificial intelligence to integrate climate, environmental, and health monitoring systems [6]. Applied in Madagascar—a region highly vulnerable to climate impacts—this framework incorporates surveillance, risk assessment, early warning systems, and resilient health-care infrastructure. By integrating health data from more than 2770 public clinics with climate and environmental exposure data, the system enables rapid health research, prediction, and public health planning [6]. Early data analysis has demonstrated strong climate sensitivity in diseases such as malaria and diarrhoea, enabling more efficient targeting of preparedness efforts [6].

2.4. Policy Translation and Governance Alignment Mechanisms

Bridging research and policy requires structured mechanisms for translation and alignment. The Sustainable Public Innovation Ecosystem framework positions public administration as a coordinating hub where technological innovation and sustainability interact through governance mechanisms and collaborative processes [4]. This framework responds to the observed evolution from e-government initiatives focused on administrative efficiency toward sustainable digital governance, where digital technologies are deployed to advance environmental protection, social inclusion, institutional resilience, and long-term economic value [4].

Within this ecosystem perspective, public administrations assume the role of orchestrators rather than sole decision-makers. They design governance frameworks, regulatory conditions, and digital infrastructures that enable collaboration and knowledge sharing across universities, firms, and citizens [4]. The framework emphasises that sustainable public value depends not on technologies themselves but on how technologies are governed, how actors collaborate, and how outcomes are measured. This insight is particularly important given persistent concerns about algorithmic bias, accountability, transparency, and ethical governance in public sector digital transformation [4].

The Transformation Network's approach to convergence research similarly emphasises continual learning with reflexive assessment and training practices [2]. This ensures that governance mechanisms remain adaptive and responsive to emerging challenges and lessons learned. Together, these frameworks suggest that effective policy translation requires not only technical infrastructure but also institutional capacity for learning, adaptation, and stakeholder engagement.

Table 1: Comparative Analysis of Major Multidisciplinary Integration Frameworks and Their Domains of Application

Framework Name	Core Components	Disciplinary Integration Level	Implementation Scale	Evaluation Methodology
Fuzzy SETS [8]	Social, ecological, technological categories with fuzzy membership; epistemological pluralism	Transdisciplinary (integrating diverse knowledge systems)	Watershed/regional systems	Collaborative system dynamics modelling; qualitative assessment of team readiness
SSPT Framework [1]	System, Social, Process, Tooling dimensions; five alignment challenges	Multidisciplinary engineering design	Industrial/organisational	Action research; usability evaluation; thematic analysis
Transformation Network [2]	Interepistemic engagement; systems dynamics; community DEIJ	Convergence research (interepistemic/interontological)	Regional sustainable systems	Reflexive assessment; training practices; community feedback
Sustainable Public Innovation Ecosystem [4]	Governance orchestration; multi-actor collaboration; digital infrastructure	Governance-policy-technology integration	National/subnational governance	Systematic review; thematic clustering; framework development
Climate-Smart Public Health [6]	Surveillance; risk assessment; early warning; resilient infrastructure	Climate science-public health-data science	Global/national health systems	Integrated data analytics; predictive modelling; early warning validation

3. Applications across Global Domains

3.1. Climate Resilience and Environmental Sustainability

Climate resilience represents perhaps the most demanding context for multidisciplinary integration, requiring simultaneous attention to physical processes, ecosystem dynamics, human vulnerability, institutional capacity, and technological infrastructure. The Climate-Smart Public Health framework operationalised in Madagascar demonstrates how integration across these domains produces actionable intelligence for adaptation [6].

The framework's application to drought monitoring and malnutrition assessment illustrates the translational pathway from integrated data to policy action. By training deep-learning models to map rice paddies and estimate crop production using satellite data, researchers can attribute reductions in crop productivity to temperature and soil moisture changes and estimate agricultural vulnerability to future drought events [6]. This information enables targeted interventions for populations most at risk of food insecurity. Similarly, harmful algal bloom detection and monitoring supports assessment of marine food intoxication and diarrhoeal illness risks, linking environmental monitoring directly to public health outcomes [6].

What distinguishes this application is its attention to data governance and community engagement. Clear data use agreements allow local governments to define access and terms of use; Institutional Review Boards provide ethical oversight; and data anonymisation protocols protect sensitive health information [6]. The system exploits low-bandwidth ground-based measurements for enhanced local accuracy, ensuring that the framework remains functional in settings with limited infrastructure. This combination of technical sophistication with institutional and ethical sensitivity exemplifies the multidisciplinary integration required for effective climate adaptation.

3.2. Digital Transformation and Smart Infrastructure

Digital transformation in the public sector has evolved from early e-government initiatives focused on administrative efficiency toward what researchers term the 'twin transition'—the convergence of digital transformation and sustainability into a unified governance agenda [4]. This transition reflects growing recognition that digital technologies can support circular economy models, green public procurement, energy efficiency, and climate resilience when properly governed.

The smart city concept illustrates both the promise and the perils of this integration. Early smart city initiatives often emphasised technological sophistication while neglecting social equity, democratic accountability, and sustainability outcomes [4]. More recent approaches position digital infrastructure within broader public innovation ecosystems, where technologies such as artificial intelligence, big data analytics, the Internet of Things, blockchain, and digital twins are evaluated not for their technical novelty but for their contribution to public value [4].

Artificial intelligence in public administration is increasingly used for predictive policymaking, resource allocation, risk assessment, and service personalisation. However, the Sustainable Public Innovation Ecosystem framework emphasises that these applications generate public value only when embedded within appropriate governance mechanisms [4]. Accountability frameworks, data governance policies, regulatory capacity, and institutional learning determine whether digital innovation translates into sustainable outcomes. Fragmented implementation, lack of digital skills, and organisational resistance remain major barriers to success [4].

3.3. Public Health and Socio-Economic System Integration

Public health has long recognised the social determinants of health, yet health systems have struggled to integrate effectively with housing, education, employment, and environmental sectors. The Global Impact Analytics Framework (GIAF) addresses this gap by providing structured methodologies for evaluating health and social service implementation across multiple sectors [5].

Developed over many years at the University of Canberra, the GIAF includes a taxonomy, glossary, and associated measurement tools for impact analysis of implementation research [5]. The framework is designed to be 'fit for purpose' for any phase of implementation research: pre-implementation (initiation), early implementation (maturity), or later implementation (evolution). Its toolkit is relevant to any sector impacted by research, including research, education, employment, policy and practice, market, population and society [5].

The framework's application to mental health and wellbeing projects for veterans and first responders across seven countries demonstrates its utility for cross-sectoral evaluation [5]. By applying an ecosystem approach to heterogeneous preventive and early intervention projects, researchers can identify what works, for whom, and under what circumstances. This evidence base supports policy decisions about resource allocation and program scaling, bridging the gap between pilot projects and systemic reform.

3.4. Sustainable Urban and Rural Development Models

Sustainable development requires approaches that are simultaneously global in orientation and locally adapted in implementation. The Puglia Region's integrated ICT platform for SDG monitoring illustrates how regional governance levels can bridge this global-local divide [3, 10]. The platform responds to growing recognition that national indicators fail to capture territorial processes at local and regional scales, and that the regional administrative level is often the most appropriate for implementing SDGs as a whole [3].

This regional focus is particularly important given the uneven distribution of progress toward the SDGs. Even within countries with limited geographic extension such as Italy, marked heterogeneities across local contexts result in substantial differences in goal implementation [3]. The Puglia platform addresses this by enabling monitoring that is sensitive to territorial specificity while remaining aligned with national and European reporting requirements.

The platform's development reflects broader trends in SDG monitoring, including the emergence of Voluntary Local Reviews and the European Commission's Regions2030 pilot project, which aims to develop a common indicator framework for SDG monitoring at the regional level across the EU [3]. These initiatives recognise that sustainable development cannot be achieved through top-down approaches alone; it requires multi-level governance systems that enable local innovation while maintaining coherence with global objectives.

Table 2: Sector-Specific Applications of Integrated Research Models

Sector/Domain	Technologies Involved	Social System Interface	Sustainability Impact	Evidence-Based Outcomes
Climate Resilience (Madagascar) [6]	Remote sensing; AI/deep learning; DHIS2 platform	Community-centred design; local government data governance	Drought early warning; malnutrition prevention; climate-adaptive health systems	Early malaria/diarrhoea climate sensitivity data; targeted preparedness
Digital Governance (EU) [4]	AI; big data; IoT; blockchain; digital twins	Multi-actor collaboration; citizen co-production	Circular economy; green procurement; energy efficiency	Thematic clusters identifying integration patterns
Public Health (Veterans/First Responders) [5]	Impact analytics toolkit; ecosystem mapping	Cross-sectoral service integration	Mental health outcomes; wellbeing improvement	Comparative evaluation across 23 projects in 7 countries
Regional SDG Monitoring (Puglia) [3, 10]	Open-source geo-database; ICT platform	Legislative-research collaboration; multi-level governance	SDG progress monitoring; evidence-based policy	Integrated VNR/VLR reporting; regional indicator framework

4. Implementation Models, Evaluation Metrics, and Institutional Integration

Translating integrative frameworks from research contexts into sustained practice requires robust implementation models and evaluation methodologies. The Global Impact Analytics Framework provides one of the most comprehensive approaches, developed through scoping reviews, nominal group techniques with subject matter experts, and real-world testing and validation [5]. The framework addresses a critical gap: while numerous frameworks, constructs, and indicators for impact analysis exist, limited tools are available on 'how to' undertake impact analysis at different implementation stages [5].

The adaptation of Technology Readiness Levels for implementation science represents another significant methodological advance. The TRL-IS checklist adapts the well-established technology readiness framework for impact assessment in implementation sciences, providing structured guidance for evaluating the maturity of implementation projects [5]. This enables more systematic comparison across projects and sectors, supporting evidence accumulation about what works in different contexts.

Cross-institutional collaboration mechanisms are essential for scaling integrative approaches. The Transformation Network's design as a National Science Foundation-supported Sustainable Regional Systems Network exemplifies how funding mechanisms can incentivise collaboration across universities, communities, and practitioners [2]. The CNRS's six interdisciplinary challenges demonstrate how national research organisations can structure communities around key questions requiring multidisciplinary responses [7]. These institutional mechanisms create the conditions for sustained collaboration beyond individual projects.

Global-local alignment strategies must navigate the tension between standardised frameworks and contextual adaptation. The European Commission's Regions2030 pilot project, developing a common indicator framework for SDG monitoring at the regional level while allowing for integrative indicators, illustrates this balance [3]. The Puglia platform's use of open-source software enables adaptation to local needs while maintaining interoperability with national and European systems [3, 10].

Financing and innovation ecosystems play a critical but often underappreciated role in supporting multidisciplinary integration. The Transformation Network's support through the National Science Foundation's Sustainable Regional Systems programme [2], the CNRS's dedicated Mission for Transversal and Interdisciplinary Initiatives [7], and the European Parliament's support for the Regions2030 pilot [3] all demonstrate that dedicated funding mechanisms are essential. However, sustainable financing requires demonstrating value for money, which in turn depends on robust evaluation frameworks that can capture the full range of multidisciplinary impacts.

5. Challenges and Future Directions

Despite significant advances in integrative frameworks, substantial barriers impede their widespread adoption. Structural and institutional barriers remain formidable: universities organised into disciplinary departments, promotion and tenure systems that reward disciplinary publication, funding streams that follow disciplinary boundaries, and government ministries organised into policy silos [2, 7]. These structures create powerful disincentives for the time-intensive work of building cross-disciplinary relationships, developing shared vocabularies, and negotiating epistemological differences [8].

Methodological integration challenges persist even when institutional barriers are overcome. Different disciplines bring different standards of evidence, different assumptions about causality, different time horizons for research, and different relationships to practice [2, 8]. The Fuzzy SETS framework explicitly acknowledges that epistemological and ontological disagreements between disciplinarily diverse research teams can hinder progress, and offers a conceptual approach for honouring diverse perspectives [8]. Yet translating this conceptual openness into practical research methodologies remains challenging.

Data governance and ethical considerations become increasingly complex as integration deepens. The Climate-Smart Public Health framework's attention to data use agreements, Institutional Review Board oversight, and data anonymisation reflects the ethical sensitivity required when integrating health, environmental, and social data [6]. Questions of data sovereignty—particularly when working with Indigenous communities—add additional layers of complexity [2]. As data integration becomes more sophisticated, governance mechanisms must keep pace.

Policy fragmentation at international, national, and subnational levels undermines efforts to implement integrated solutions. The Puglia platform's development responded to recognition that even within countries, heterogeneities across local contexts require differentiated approaches [3]. Yet this local adaptation must be balanced against the need for coherent national and international frameworks. The tension between standardisation and contextualisation will remain a central challenge for sustainable development governance.

Future research trajectories should focus on several priorities. First, further development and validation of evaluation frameworks capable of capturing multidisciplinary impacts across different sectors and scales [5]. Second, comparative research on institutional mechanisms that successfully support transdisciplinary collaboration across different national and cultural contexts. Third, investigation of how digital technologies can support rather than undermine epistemological pluralism and community engagement [6]. Fourth, longitudinal studies tracking the translation of integrative research into policy outcomes and sustainability impacts.

Table 3: Advantages, Limitations, and Implementation Characteristics of Multidisciplinary Approaches

Approach Type	Strengths	Limitations	Institutional Requirements	Policy Implications
Systems-Based Frameworks [1, 8]	Addresses complexity; identifies feedback loops; enables holistic understanding	Can become overly abstract; difficult to bound system boundaries	Systems thinking capacity; modelling expertise; interdisciplinary teams	Supports integrated policy design; reveals unintended consequences
Convergence/Transdisciplinary Research [2]	Integrates diverse knowledge systems; community-engaged; addresses root causes	Time-intensive; requires epistemological negotiation; difficult to evaluate	Community partnerships; flexible funding; reflexive assessment capacity	Enables culturally appropriate solutions; builds implementation legitimacy
Digital Integration Platforms [3, 4, 6]	Enables data integration; supports real-time monitoring; scales across contexts	Risk of technological determinism; data governance challenges; equity concerns	Technical infrastructure; data governance frameworks; digital skills	Supports evidence-based policy; enables performance monitoring
Impact Evaluation Frameworks [5]	Systematic comparison; evidence accumulation; supports scaling decisions	Requires significant data; may oversimplify contextual factors	Evaluation expertise; longitudinal data; cross-project coordination	Enables resource allocation; supports accountability; informs scaling

6. Conclusion

This article has examined integrative multidisciplinary research frameworks that systematically bridge science, technology, engineering, social systems, and sustainable development. The frameworks analysed—Fuzzy SETS, SSPT, Transformation Network, Sustainable Public Innovation Ecosystem, Climate-Smart Public Health, and Global Impact Analytics Framework—represent diverse yet complementary approaches to integration. Across these frameworks, several common themes emerge.

First, successful integration requires attention not only to technical interoperability but to epistemological pluralism. Acknowledging that different disciplines and knowledge systems may legitimately categorise and understand phenomena differently is essential for genuine collaboration [2, 8]. The Fuzzy SETS framework's explicit embrace of multiple memberships and the Transformation Network's interepistemic approach exemplify this principle.

Second, institutional structures matter profoundly. The persistence of disciplinary silos in universities, funding agencies, and government ministries systematically undermines integration efforts. The dedicated programmes and missions established by organisations such as the National Science Foundation, CNRS, and European Commission demonstrate that targeted institutional mechanisms can counter these tendencies [2, 3, 7].

Third, digital technologies offer unprecedented opportunities for integration but also introduce new risks. Integrated ICT platforms, artificial intelligence, remote sensing, and data analytics enable the synthesis of information across sectors and scales that was previously impossible [3, 4, 6]. Yet these technologies must be embedded within robust governance frameworks that address data sovereignty, ethical use, equity, and accountability.

Fourth, evaluation methodologies must evolve to capture the full range of multidisciplinary impacts. The Global Impact Analytics Framework and TRL-IS checklist represent important advances, enabling systematic comparison and evidence accumulation across heterogeneous projects and contexts [5].

The strategic importance of integrative frameworks for global sustainable development cannot be overstated. The Sustainable Development Goals explicitly recognise the interconnectedness of economic, social, and environmental objectives; achieving them requires governance and research systems capable of operating across these domains simultaneously. The frameworks examined in this article provide conceptual resources, methodological tools, and practical guidance for this work.

Looking forward, future multidisciplinary research agendas must prioritise the institutional and governance dimensions of integration alongside technical and methodological advances. The most sophisticated integrative framework will fail if embedded within institutional structures that reward fragmentation. Policy and institutional transformation—in universities, funding agencies, government ministries, and international organisations—is essential for creating the conditions under which integrative research can flourish and translate into sustainable outcomes.

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