Building a data-driven and complexity-aware digital infrastructure for effective multilateralism

A coalition-based public-good initiative anchored in International Geneva, combining artificial intelligence, modern data science, simulation tools, and interoperable governance data to strengthen multilateral cooperation under complexity.

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ABOUT THIS POLICY REPORT

This policy report is an output of a Triangle Azur World Knowledge Dialogue on Multilateralism in crisis: the role of science diplomacy in turbulent times that took place in Geneva from 12th to 14 January 2026. This workshop was jointly organized by the Science in Diplomacy Lab (SiDLab) and the Geneva Transformative Governance Lab (GTGLab) in collaboration with the Geneva Science and Diplomacy Anticipator (GESDA), the Geneva Science-Policy Interface (GSPI), and the United Nations University Centre for Policy Research Office in Geneva (UNU-CPR).

Executive summary

This policy report proposes the creation of a data-driven and complexity-aware digital infrastructure for multilateralism: a shared global public-good infrastructure combining artificial intelligence, modern data science, simulation tools, and interoperable governance data to improve collective sense-making, coordination, and adaptive capacity across the multilateral system. The proposal responds to a growing mismatch between the complexity of global challenges and the adaptive capacities required to govern them effectively. Climate change, pandemics, geopolitical instability, financial shocks, technological disruption, and food insecurity increasingly interact across sectors, institutions, and regions, while the multilateral system is constrained by growing political and financial pressures. Conceived as a coalition-based initiative anchored in International Geneva, the infrastructure would support diplomats, international organizations, researchers, and policymakers by making multilateral governance more intelligible, navigable, and actionable. An indicative investment of CHF 28 million over five years would provide the foundational capacity needed to develop the infrastructure, data standards, analytical tools, and governance mechanisms required to operationalize this agenda.

Across the multilateral system, growing geopolitical polarization has weakened consensus-building, while intensifying geostrategic competition has increased contestation over institutional norms, mandates, and authority. Many international organizations already face chronic financial constraints, increasing dependence on earmarked funding, and widening gaps between institutional mandates and operational capacities. Recent declines in contributions from major donor states have further intensified these pressures, triggering major staff reductions, institutional restructuring plans, program cuts, and, in some cases, the relocation of operations. These disruptions highlight the urgency of developing more innovative, adaptive, and effective forms of multilateral cooperation. The current historical moment creates both pressure and opportunity to rethink how multilateralism is organized, coordinated, and supported under conditions of growing systemic complexity and uncertainty.

The need for collective responses to global challenges has rarely been greater. Closing a single strategic chokepoint such as the Strait of Hormuz can trigger cascading effects across global energy markets, food systems, and supply chains, while also affecting inflation, financial stability, and geopolitical security. This example illustrates the extent to which contemporary global systems have become tightly coupled and structurally fragile under conditions of uncertainty. The current polycrisis is therefore not only a crisis of multilateral cooperation. It is also a crisis of collective sense-making: multilateral actors are increasingly required to make decisions in the face of interconnected problems. Yet the institutions designed to address these problems are unevenly equipped to learn across boundaries. As a result, multilateral institutions are increasingly expected to address highly complex and rapidly evolving problems while operating under conditions of political contestation, financial uncertainty, institutional fragmentation, and chronic operational overload.

A complexity view helps move beyond two limiting assumptions. The first is that global governance can be improved mainly by reforming institutions one by one. The second is that fragmentation is simply a problem to be eliminated. From a systems perspective, governance outcomes emerge not only from the characteristics of individual institutions but also from the patterns of interaction among them. Reforming organizations in isolation may therefore fail to address system-wide dynamics that arise through interdependence, feedback, and network effects. Similarly, institutional overlaps can generate duplication, competition, and incoherence. But they can also provide redundancy, alternative pathways for action, and opportunities when one venue is blocked. The challenge is therefore not to impose full coordination from above, which is neither realistic nor necessarily desirable. Instead, it is to identify where coordination matters most, which institutional connections are structurally important, and where targeted interventions could improve feedback, learning, and adaptive capacity. Meeting this challenge requires analytical capabilities that can make the structure and dynamics of the multilateral system visible at scale.

Recent advances in data science, artificial intelligence, network analysis, natural language processing, and computational modeling make large-scale analysis of multilateral governance technically possible. Multilateralism produces vast quantities of structured and unstructured data, ranging from resolutions, treaties, and voting records to negotiation texts, institutional mandates, and implementation reports. Yet these data remain dispersed across institutional repositories, often designed for human consultation rather than systematic analysis. As a result, multilateral actors frequently operate with only partial visibility of the broader governance landscape. They may know the documents of their own institution, but struggle to trace how an issue evolves across organizations, how concepts migrate across policy fields, where bottlenecks emerge, or which past formulations helped unlock agreement in comparable contexts.

The datafication of multilateralism should not be understood as a purely technical exercise, nor as a replacement for diplomacy, legal interpretation, political judgment, or contextual expertise. Its strategic value lies in strengthening the adaptive capacity of multilateral actors to observe, interpret, and respond to systemic events in real time. Better data and analytical infrastructure can help actors assess whether governance responses match the scale and interconnectedness of the problems they seek to address, identify emerging coordination failures, detect institutional blind spots, and evaluate how cooperation evolves across organizations over time. The broader objective is to bridge two forms of knowledge that are often separated by the very way institutions and knowledge systems are organized: knowledge of global problems and knowledge of the governance processes designed to address them. Linking these domains would make it possible to evaluate not only what is happening in the world, but also whether multilateral institutions are responding at the right scale, through appropriate channels, and with sufficient coherence over time. This calls for a shared digital public good that can make governance processes more visible, intelligible, and analyzable across institutional boundaries.

The proposed digital infrastructure would provide a shared analytical foundation for diplomats, international civil servants, researchers, and policy actors. It would combine document processing, semantic analysis, citation network analysis, interactive visualization, domain-adapted large language models, retrieval-augmented generation, and simulation tools within an interoperable analytical environment. An open-access and scalable data science platform would make large corpora of multilateral documents searchable, comparable, and analyzable across institutions. AI-enabled simulation environments and, over time, digital twins of selected multilateral problem ecosystems could help users explore negotiation scenarios, test institutional design options, anticipate coalition dynamics, and assess the possible system-level effects of external shocks or internal reforms.

The proposed infrastructure would generate benefits in three complementary areas. First, it would improve diplomatic practice. Diplomats, negotiators, and international civil servants could more easily identify relevant precedents, compare institutional positions, trace the evolution of concepts, detect inconsistencies across mandates, and locate past compromises. A negotiator could ask which coalitions historically supported or resisted a given formulation. A secretariat of an international organization could examine how a concept has evolved across bodies and over time. A donor government could identify which organizations appear most central or active on a specific issue. These functionalities would not remove political disagreement, but they would reduce informational friction and facilitate better preparation, coordination, and decision-making.

Second, the proposed infrastructure would strengthen the scientific study of global governance. Existing research has generated important insights into institutional complexity and diversity, voting patterns, norm diffusion, and organizational performance. Yet empirical work remains uneven and often limited by fragmented data, short time series, and difficulties in linking legal, political, institutional, and scientific information. A shared digital infrastructure would enable large-scale, longitudinal, and relational analysis of multilateral governance. It would support research into how norms emerge, how institutions interact, how policy domains co-evolve, how system-level risks accumulate, and how governance arrangements respond to shocks. In doing so, it would help move the study of multilateralism from a focus on individual institutions toward a more granular understanding of how the global governance system functions in practice.

Third, the infrastructure would strengthen the interface between science and diplomacy. Many global challenges require evidence from the natural sciences, social sciences, and humanities. Yet evidence on the problem and on governance responses is often produced, stored, and used separately. By connecting data

on global challenges with data on mandates, resolutions, commitments, and institutional processes, the proposed infrastructure would help assess whether multilateral responses are commensurate with the scale of the problems they address. It would also help identify gaps between scientific consensus and policy action, trace how scientific knowledge enters normative frameworks, and produce decision-oriented outputs such as dashboards, short analytical briefs, comparative snapshots, and traceable drafting support.

While the benefits of such an infrastructure would extend across the multilateral system and the broader international community, its development requires an ecosystem capable of bringing together governance actors, scientific expertise, and technical innovation. International Geneva offers a particularly strong ecosystem in which to prototype and host such an initiative. It brings together multilateral institutions, scientific expertise, standard-setting bodies, diplomatic missions, civil society organizations, and technical capacities. This institutional density makes Geneva not only a unique place to study the multilateral system but also an ideal site to test new tools for multilateral cooperation, refine them, and embed them in practice. A trusted infrastructure hosted in or through Geneva would also resonate with Switzerland's longstanding role as a convenor and supporter of effective multilateral solutions.

The proposed infrastructure should be treated as a global public good, rather than as a commercial service accessible only to those able to pay. A coalition-based public good model would aim for broad access, societal relevance, scientific rigor, and institutional trust. The initiative could be supported by a coalition of willing states acting as "digital host states". These states would support the development and stewardship of a shared digital infrastructure while keeping access as open as possible for non-funding states, multilateral institutions, researchers, and other legitimate users, subject to appropriate safeguards for security, data protection, neutrality, and institutional independence.

The proposed investment of CHF 28 million over five years would support three mutually reinforcing pillars: the continuous development and maintenance of the digital and AI infrastructure; the datafication of multilateral governance across selected policy domains together with the interdisciplinary research needed to generate robust analytical methods and actionable insights; and the development of user-oriented interfaces, visualization tools, outreach activities, and training mechanisms capable of supporting broad institutional uptake over time.

Three recommendations follow. First, Member States and other actors committed to effective multilateralism should invest in the digital infrastructure needed to make multilateral governance more transparent, analyzable, and adaptive. Second, international organizations, researchers, and technical partners should develop interoperable data standards, including shared ontologies, canonical identifiers, metadata schemas, and machine-readable publication practices. Third, the initiative should be governed through a strong science-policy interface that is independent, coalition-based, scientifically credible, and close enough to diplomatic practice to ensure that its outputs are useful, trusted, and responsive to real institutional needs.

As an immediate next step, a multi-stakeholder event should be convened in International Geneva to launch a dialogue on the datafication of multilateralism. The event should bring together Member States, international organizations, research institutions, technical experts, civil society actors, potential funders, and other relevant public and private partners. The purpose of the event would be to build a shared understanding of the strategic value of digital infrastructure for multilateral governance, identify priority policy areas and pilot use cases, and explore options for financing, governance, and institutional anchoring. By improving the capacity of multilateral actors to observe, interpret, and coordinate across complex governance systems, such an initiative could strengthen institutional learning and more adaptive forms of governance under conditions of uncertainty.

Contents

1 Scientific diplomacy in a turbulent multilateral context

Multilateralism, as we know it, is facing severe headwinds. Paradoxically, the need for collective solutions to global challenges, grounded in rigorous scientific assessment, has never been greater. The root causes of the current situation, including factors such as discontent with globalization, nationalism, and disinformation among concomitant demographic, epidemiological, technological, and ecological transitions, will need to be analyzed and plainly understood. However, there is also an urgent need for adaptation to a rapidly evolving environment. First, dialogue must be sustained and channels of communication kept open. Second, attention should be refocused on functions for which multilateral coordination remains indispensable, such as sustaining dialogue, producing shared knowledge, coordinating responses to transboundary risks, and maintaining essential technical cooperation. Third, experimentation is needed to identify effective solutions and strengthen resilience. This context calls for flexible institutional arrangements capable of operating at variable geometries, depending on the issue and the constellation of willing actors (Keohane & Victor, 2011; Abbott & Faude, 2021). While the United Nations (UN) and the multilateral system are facing acute funding pressures, this policy report contends that science diplomacy can make the multilateral system both more resilient and more effective in the current context.

Over the past two decades, the literature on science diplomacy has focused on conceptualizing its forms (Fedoroff, 2009; Kaltofen & Acuto, 2018; Rüland et al., 2025; Turchetti & Lalli, 2020). **Building on this, we conceptualize the relationship between science and multilateral diplomacy as a positive feedback loop. On the one hand, science diplomacy depends on effective institutions to facilitate international cooperation, enabling the pooling of expertise, resources, and data to address global challenges. On the other hand, multilateralism benefits from science diplomacy through scientific collaboration that fosters trust, builds consensus, and supports evidence-informed policymaking.** While the role of science diplomacy is to leverage scientific collaboration to strengthen multilateral cooperation, multilateralism provides the institutional framework and convening forums through which it can operate effectively. Climate change governance illustrates how science diplomacy and multilateralism reinforce each other in addressing global challenges (De Pryck, 2025; Livingston & Rummukainen, 2020; Livingston & Rummukainen, 2023). On the one hand, the Intergovernmental Panel on Climate Change (IPCC) assesses and synthesizes the scientific consensus on climate change through thousands of scientists collaborating across borders. The IPCC Assessment Reports establish the evidence base that underpins multilateral climate negotiations. On the other hand, the United Nations Framework Convention on Climate Change (UNFCCC) provides the institutional infrastructure for translating scientific findings into coordinated global action, with mechanisms like Global Stocktake designed to incorporate emerging scientific understanding into policy commitments.

In this policy report, **we focus on the dimension of science IN diplomacy, namely the capacity to understand the multilateral system itself using scientific tools.** The aim is not only to generate knowledge about multilateralism as an object of study, but also to translate that knowledge into practice by informing institutional design, supporting diplomatic decision-making, and improving the capacity of multilateral actors to navigate complexity. We contend that 1) the development of complexity science provides a bridge between the natural and social sciences by connecting knowledge about global problems with knowledge about the institutions and coordination processes designed to address them, and 2) rapid advances in computing power and artificial intelligence significantly expand the potential of science in diplomacy to strengthen the resilience and effectiveness of multilateralism by facilitating data collection, analysis, and access to information. We argue that **International Geneva provides a particularly valuable ecosystem for harnessing modern information technologies, shaping emerging governance standards, and translating scientific findings into practice. It is not only a strategic site for studying multilateral governance, but also a direct beneficiary of the knowledge, tools, and institutional innovations that such work can generate.** We estimate that an

investment of CHF 28 million over five years, based on preliminary benchmarking against comparable digital and research infrastructure initiatives, would make it possible to build the digital infrastructure of multilateralism for the 21st century.

2 A complexity view of multilateralism

Multilateralism was designed and then evolved through sectoral institutions and specialized mandates, an architecture that works best when problems can be decomposed and handled in relative isolation (Alter & Meunier, 2009; Kim, 2020). Many of today's agenda-defining challenges, however, unfold as intricately coupled human-natural systems with nonlinear dynamics and cross-domain spillovers, making coordination and learning across institutions a central performance constraint (Cosens et al., 2021; Liu et al., 2007). The institutional architecture established after 1945 assumed that trade, health, security, and the environment could be governed by specialized organizations operating largely in parallel. Two decades of scholarship at the intersection of complexity science and International Relations have demonstrated that this assumption no longer holds (if it ever did). The multilateral system is not a collection of independent parts but a complex adaptive system, i.e., a densely interconnected network of heterogeneous institutions, actors, norms, and feedback loops whose behavior cannot be understood by examining its components in isolation (Abbott et al., 2016; Alter & Raustiala, 2018; Kim, 2020; Orsini et al., 2020; Wernli, 2023; Winston, 2023). Complexity science provides the conceptual and methodological framework to apprehend this reality and, in doing so, offers a pathway to strengthen the multilateral endeavor. This perspective is particularly timely in a context of polycrisis (Søgaard Jørgensen et al., 2024), where financial, ecological, geopolitical, technological, and health disruptions increasingly interact across domains and amplify one another. In such a tightly coupled environment, shocks rarely remain confined to a single sector, and multilateral governance can no longer be understood or organized through sectoral silos alone (Wernli et al., 2023a). Complexity theory is therefore not only analytically useful, but also practically necessary for understanding how the system functions under stress.

The integration of complexity thinking into the study of global governance has passed through distinct phases. In the early 2000s, complexity was used mainly as a metaphor, with scholars drawing on ideas such as emergence, self-organization, and nonlinearity to challenge simplified models of international relations (Bousquet & Curtis, 2011; Harrison, 2006; Kavalski, 2007; Lehmann, 2012). A second, analytical phase saw specific complexity concepts operationalized through network analysis of institutional architectures, agent-based modeling of conflict and cooperation, and computational text analysis of multilateral corpora (Cederman, 2003; Gentzkow et al., 2019; Hafner-Burton et al., 2009; Kim, 2020). We now stand on the cusp of a third phase: a computational phase, in which data science, machine learning, and large language models are being deployed to map, measure, and simulate the multilateral system at scale (Lazer et al., 2009; Wernli, 2023; BigScience Workshop, 2022; Üstün et al., 2024). This progression from metaphor to operationalization is moving complexity from the margins of International Relations (IR) theory to the center of the analytical toolkit for global governance.

The benefits of using a complexity science approach are threefold. **First, it offers a uniquely productive analytical perspective on institutional complexity.** The number of intergovernmental organizations has grown from fewer than one hundred in 1945 to over five hundred today, each being embedded in a web of overlapping mandates, shared memberships, and competing authority claims (Pevehouse et al., 2020). Complexity science reframes this proliferation as an emergent property of a system adapting to multiplying demands. Network analysis reveals that institutional complexity is not random disorder: it exhibits organized structure (e.g., small-world properties, emergent hierarchies, and clustered communities) that arise through self-organization rather than top-down design (Kim, 2013). This suggests a practical reform agenda. Rather than trying to coordinate every institution from the top down, reform efforts can start from the actual shape of the institutional network: which organizations are connected, which ones bridge otherwise separate communities, and where information, norms, or practices tend to circulate. Some institutions, platforms, or coordination bodies play this bridging role particularly well. They translate priorities across policy areas and keep feedback moving between different levels of governance. Supporting these connectors may therefore be more effective than adding another layer of coordina-

tion, especially when it helps institutions learn from one another across levels, adjust their practices, and respond more quickly to emerging problems (Faude & Abbott, 2025; Kim, 2020; Hafner-Burton et al., 2009; Panke & Stapel, 2025).

Second, the complexity lens is particularly suitable for understanding non-linear dynamics, resilience, and adaptation. Recent global crises have made these dynamics especially visible. The 2008 financial crisis showed how tightly coupled financial networks can transmit shocks far beyond their point of origin (Battiston et al., 2016). The COVID-19 pandemic illustrated how a public-health emergency can rapidly spill into disruptions affecting mobility, supply chains, economic activity, education, and fundamental freedoms (Clausin et al., 2023). More recently, war-related shocks have demonstrated how conflict can reverberate across food, energy, and trade systems well beyond the immediate theatre of confrontation. In each case, disturbances initially perceived as sector-specific quickly became systemic. These examples help explain why multilateral outcomes in a multipolar system are increasingly shaped less by one or two dominant actors and more by interaction effects across institutions, coalitions, and policy domains. Feedback loops, cascading dynamics, and tipping points become more salient; small perturbations can propagate unpredictably; and the same intervention can produce markedly different outcomes depending on timing and context (Cosens et al., 2021; Orsini et al., 2020). Complexity science provides a formal language and analytical tools to understand these patterns without reducing them to oversimplified equilibrium models. Agent-based and network approaches have shown how micro-level interactions can generate macro-level dynamics characteristic of complex adaptive systems, including cascade effects across alliance or governance networks (Cederman, 2003; Jackson & Nei, 2015).

These non-linear dynamics are compounded by the "polycrisis," i.e., the simultaneous occurrence of multiple, interacting crises that amplify one another in ways that exceed the sum of their parts (Lawrence et al., 2024). A polycrisis arises from dense interconnections between subsystems (financial, ecological, geopolitical, technological) that allow shocks to propagate across domains. Sector-based multilateral governance is structurally ill-equipped for crises whose defining feature is cross-domain interaction. A complexity lens, therefore, reframes polycrisis as an expected emergent property of a tightly coupled global system approaching critical thresholds, redirecting attention from optimizing individual institutional components to maintaining system-level functioning under stress. This reframing also motivates a monitoring agenda: network analysis, simulation, and early-warning indicators derived from critical-transition theory can help track systemic risk and identify vulnerabilities before they cascade, for example, by monitoring abrupt coalition realignments in voting or positioning data, growing delays and congestion in negotiation or mandate-implementation processes, or increasing dependence on a small number of institutional hubs (Clausin et al., 2023; Dakos et al., 2012; Scheffer et al., 2009; Wernli et al., 2023b; Young, 2017).

In this context, resilience is best understood as a desirable property of a system to absorb shocks, adapt, reorganize, and continue delivering core functions under conditions of volatility (Faude & Abbott, 2025). Resilience-oriented design foregrounds redundancy (multiple pathways to act), modularity (containing failure and preventing contagion), diversity of actors, venues, and instruments, and learning mechanisms that enable experimentation and revision over time (Ruhl, 2011; Ruhl, Cosens, & Soininen, 2021). From an institutional complexity perspective, these properties often materialize through overlapping and sometimes "low-cost" arrangements that create functional redundancy: when one venue stalls or becomes contested, actors can shift tasks, layer new cooperation formats, or rely on alternative institutions, thereby helping the system continue to deliver under stress (Abbott & Faude, 2021; Faude, 2020).

Third, complexity theory provides a shared language between the natural and social sciences, as well as across quantitative and qualitative approaches. Several of the most important challenges that define the contemporary multilateral agenda (e.g., pandemic preparedness, climate change, biodiversity loss, systemic financial risk) are inherently transdisciplinary. They involve coupled human-natural systems whose behavior cannot be understood within any single disciplinary tradition. Complexity science, with its origins in several areas of science and applicability to social, economic, and political phenomena, provides a shared vocabulary that enables many disciplines to collaborate on common problems (Castellani & Gerrits, 2024). This shared language is compatible with established qualitative traditions, which contribute contextual interpretation, normative reflection, historically grounded analysis, and critical scrutiny of power asymmetries, epistemic hierarchies, and institutional biases embedded in multilateral systems. The shared language of complexity is also practically relevant, because coordination often depends on aligning meanings across communities. A recurring example concerns "data", a term that can refer both to natural-science evidence (measurements, ob-

servations, and experimental results about physical systems) and to governance data (structured evidence of institutional behavior revolving around mandates, voting patterns, negotiation dynamics, agenda-setting, stakeholder networks, implementation signals, and compliance gaps). Both layers are essential, yet they are not automatically interoperable. Even robust evidence about physical systems may have a limited impact on collective outcomes if it does not reach the right actors, through the right channels, and at the right moment.

3 The role of data to support effective multilateral cooperation

Due to historical constraints in computing power and data availability, the complexity perspective has often been used in a largely metaphorical manner. While this has generated valuable insights, its full descriptive and explanatory potential is reached only when coupled with computational science, which enables the formalization, measurement, and simulation of the multilateral system. Multilateralism generates a large volume of structured and unstructured data, including diplomatic texts, voting records, meeting agendas, sponsorship patterns, coalition structures, citations of previous decisions, and iterative negotiation cycles across bodies such as the United Nations. These data sources provide empirical access to core phenomena in global governance, especially when they are integrated in an interdisciplinary manner. They allow the identification of normative diffusion processes, institutional path dependencies, coalition formation dynamics, agenda-setting mechanisms, inter-organizational coordination patterns, and the emergence and resilience of institutional complexes. They further permit the examination of how policy domains co-evolve, how mandates proliferate or consolidate, and how epistemic communities shape institutional trajectories over time.

Given the richness of insights that can be gained from the combined application of complexity theory and computational methods to multilateralism, there are strong arguments for investing in the further datafication of multilateralism, structured around **two complementary and analytically distinct uses of data**. First, data is a cornerstone of collective action in a complex and uncertain world. Without systematic measurement, policy action operates in partial blindness. Data enables the assessment of the magnitude, distribution, and evolution of global challenges, as well as the evaluation of the effectiveness of both national and internationally agreed responses. Major advances in global governance have been closely linked to improved measurement capacities, for example, in relation to ozone depletion (Benedick, 1998), biodiversity loss (Butchart et al., 2010), or the global burden of disease (Vos et al., 2020). While data alone does not compel action, it can structure decision-making, inform prioritization, and mobilize political and societal engagement. In this sense, **data supports multilateralism by strengthening evidence-based policy design, implementation, and monitoring**. Indeed, for countries that want to invest in supporting a cause, it is a foundation for evaluating the impact of their actions on their own countries, on other countries, and on the issue itself.

Second, data is increasingly available not only on policy problems and outcomes, but also on the often intricated governance processes that shape collective action. This includes data on how policies are negotiated, adopted, coordinated, implemented, and reviewed across institutions (Voeten, 2000; Bailey et al., 2017). Until recently, this dimension of multilateral governance remained largely opaque and weakly measured. Advances in digitalization, text analysis, and network methods now make it possible to systematically observe patterns of institutional interaction, norm emergence and diffusion, and coordination across the multilateral system (Baturo et al., 2017; Mesquita & Pires, 2025; Wernli et al., 2023b). These **data provide empirical insight into how multilateralism functions as a system, rather than as a set of isolated institutions.** Recent work already illustrates several of these applications, including the impact of the Sustainable Development Goals on the network structure of international organizations (Bogers et al., 2022), the quantitative analysis of human rights discourse in norm evolution (Winston, 2023), and the circulation of environmental concerns into global health governance based on an analysis of World Health Assembly resolutions (Evrard et al., 2025). These dynamics are increasingly amenable to scientific analysis.

A central challenge is to **better connect the two domains described above**, i.e., knowledge about the issues to be governed and knowledge about the governance system itself (Galaz, 2019; Young, 2017; Wernli, 2023). These domains are typically addressed by different academic communities: the former by natural and social sciences focused on substantive problems and outcomes, and the latter by disciplines concerned with institutions, law, and political processes. While different communities use the word 'data' to mean different things, there is growing convergence around the area of data science

to connect different types of data. **Connecting data on policy problems and outcomes with data on governance enables the assessment of which institutional configurations, coordination mechanisms, and procedural processes are most conducive to effective collective action for a specific issue.** Such integration ultimately supports a more adaptive form of multilateralism, grounded in evidence about what works and how it works. It can directly inform reform efforts at the United Nations. A concrete example is the UN80 Informal Ad Hoc Working Group on Mandate Implementation Review, which aims to identify principles and follow-up actions to improve the creation, delivery, and review of mandates (United Nations, 2025a).

4 Elements for an effective data ecosystem to support multilateralism

Recent advances in the computational study of multilateralism are producing novel empirical insights and shaping developments in the field of International Relations. Citation network analysis of international agreements and resolutions has revealed that institutional complexity exhibits organized structure, such as small-world properties and emergent hierarchies arising through self-organization (Mesquita & Pires, 2025; Ridi & Gasbarri, 2023; Wernli et al., 2025), which resonates deeply with the regime complex literature (Gehring & Faude, 2013; Henning & Pratt, 2023). Natural language processing techniques, including transformer-based embedding models and neural topic modeling, now enable paragraph-level semantic analysis across hundreds of thousands of institutional outputs, such as UN documents. This helps uncover norm diffusion pathways and thematic evolution, hard to detect systematically with qualitative methods alone (Hanania, 2021; Sovrano et al., 2020; Wernli et al., 2025). Voting pattern analysis, leveraging diffusion geometry, dynamic network models, and latent-space clustering, has mapped the shifting architecture of diplomatic alignments from Cold War bipolarity to contemporary multipolarity (Bailey et al., 2017; Le et al., 2013; Macon et al., 2012). These are only examples of the multiple ways through which the combination of complexity theory and computational methods is improving our understanding of multilateralism. Together, these approaches constitute the methodological foundation of computational diplomacy as a data-driven science of multilateral governance.

Among these developments, several critical methodological skills have been developed in research labs worldwide. These skills include processing UN system text documents, with complete analytical pipelines spanning from data acquisition to scientific outputs. This covers automatic document collection, optical character recognition (OCR), and preprocessing to standardize diverse source types. Advanced natural language processing (NLP) extracts entities, relationships, and semantic content, while network analysis maps relationships between norms and institutions and allows inference about their structural configurations. Time series analysis tracks the evolution of topic and institutional dynamics and helps identify structural change points, including regime shifts, tipping points, and periods of systemic reconfiguration (Macon et al., 2012; Scherer et al., 2025). These foundational capabilities, validated on a limited number of institutional domains and document corpora (e.g., UN resolutions and selected thematic corpora) are scalable to the broader sets of documents produced by the multilateral system. The recent advent of large language models (LLMs) creates opportunities to augment these analytical methods with natural-language interaction and generative capabilities while also supporting new applications in negotiation simulation and scenario exploration. To realize this vision and accelerate the datafication of multilateralism, **we identify two complementary approaches**.

A first approach is to develop state-of-the-art, **open-access data science platforms that allow users to systematically analyze, synthesize, and visualize information from documents produced and adopted by international organizations,** with the overarching aim of deepening understanding of multilateral governance and enhancing decision-making in diplomacy. More broadly, such platforms reinforce the emerging norms of open science, which, as the preamble of UNESCO's Recommendation on Open Science (UNESCO, 2021) points out, furthers the human right to science (Romano & Boggio, 2024). Such data platforms should feature interactive visualization dashboards accessible through an intuitive interface, with a scalable, modular architecture that can integrate additional data sources as needs evolve. To be useful to many people without programming skills, the platform's large language model foundation enables natural-language queries. To preserve trust and analytical integrity, such querying and synthesis functions should be designed with transparency regarding sources, assumptions, model limitations, and potential biases, especially in institutional contexts (Boyd & Crawford, 2012; Kitchin, 2017).

Another step related to this first approach is to develop **digital twin environments for selected multilateral problem ecosystems.** Unlike document analysis platforms, which improve access to information, or negotiation simulations, which focus

on actor behavior in specific bargaining settings, digital twins would model the structure and dynamics of complex governance systems over time. They would integrate data on institutions, mandates, actors, policy instruments, and issue-specific indicators in order to represent how different components of a multilateral ecosystem interact, adapt, and respond to disturbance. This would make it possible to explore the system-level effects of both external shocks, such as war, pandemics, or sudden market disruptions, and internal changes, such as the adoption of a new treaty provision, the creation of a coordination mechanism, or the reallocation of institutional mandates. In practical terms, digital twins could support stress-testing, scenario exploration, and the assessment of policy options in domains such as trade, food security, global health, or climate governance. By helping users identify critical nodes, feedback loops, bottlenecks, and potential cascade effects before decisions are made, they would provide a genuinely systems-oriented complement to document analytics and negotiation simulations.

A second approach is to develop **online simulation environments to support both diplomatic practice and research**. Simulation platforms should leverage LLMs and complementary computational approaches to create realistic, interactive negotiation environments for training, research, and anticipation purposes. Users would be able to define negotiation scenarios by specifying the parties involved, their interests, constraints, and red lines, as well as the broader institutional and geopolitical context. The platform would generate AI agents representing different stakeholders (drawing on document corpora, historical precedents, and expert knowledge to approximate their reasoning styles, priorities, and likely responses to proposals, which can be largely inferred from the first approach). During simulated negotiations, users can test different negotiation strategies, explore trade-offs, and receive assessments of proposal feasibility across parties to enhance their capacities to identify potential sticking points, flag inconsistencies, and help foster creative options. Beyond its practical applications, the platform would serve as a research infrastructure for studying negotiation dynamics, norm diffusion, and institutional design under controlled conditions.

Both the data platform and simulation capacities should draw on modern data science and computational modeling foundations, as well as an LLM specifically trained through continued pre-training on 50-100 billion tokens of diplomatic documents, followed by instruction fine-tuning on tasks central to multilateral governance (e.g., summarization, entity extraction, temporal analysis, coalition identification, argument generation). These capabilities can be supported by a range of complementary developments, including retrieval-augmented generation (RAG) systems that ground AI outputs in validated data, documentary sources, fine-tuned models for domain-specific tasks such as resolution drafting and treaty analysis, and application programming interfaces (API) that allow partner institutions to integrate these tools into their own workflows. These modern capabilities require dedicated GPU infrastructures for diplomacy, a critical investment given that most advanced analytical and generative technologies now rely on high-performance computing. However, the rise of training and inference platforms makes the dedicated infrastructure accessible at a fraction of the cost of fully developing a full-fledged LLM.

5 Expected benefits and impact

The digital infrastructure delineated above (data platforms, simulation environment, and GPUs) is expected to generate benefits along three complementary domains: first, by enhancing the practice of multilateral diplomacy; second, by advancing the scientific study of global governance; and third, by strengthening the interface between science and diplomacy through more integrated forms of science diplomacy. Taken together, these contributions support a shift toward a more adaptive form of multilateral governance that is both evidence-informed and system-aware. This adaptive capacity is realized through three reinforcing mechanisms: (1) improving operational efficiency, (2) strengthening coordination and coherence across institutions and mandates, and (3) enhancing learning over time.

At the diplomatic level, the proposed infrastructure addresses a core challenge of contemporary multilateralism: the difficulty of navigating, interpreting, and mobilizing an increasingly dense and fragmented body of governance instruments. By rendering this complexity tractable, it enables diplomats, negotiators, and international civil servants to operate more efficiently and to ground their actions in systematically accessible evidence. The infrastructure will substantially enhance the capacity of diplomats to identify what works, for whom, and under which conditions. It will also allow users to select a governance issue and find the most relevant documents addressing it both within and across different organizations; to identify solutions supported by the best available scientific evidence; to examine a specific organization and quickly assess its priorities and level of commitment on topics linked to a governance challenge; and to trace the documentary lineage of any instrument (i.e., both the texts that led to its adoption and those that followed from it). Beyond retrieval and analysis, the infrastructure will support the drafting of normative documents that integrate scientific developments and offer interactive tools for visualizing data and governance processes.

These functionalities translate abstract capabilities into concrete applications across different professions. A diplomat could ask which coalitions have historically supported or resisted a given formulation across UN bodies; a negotiator could ask which past compromises, fallback formulations, or cross-references have helped unlock deadlock on a similar issue; a policy maker or international civil servant could ask which mandates, resolutions, and institutional processes are most relevant to a current governance challenge and where implementation bottlenecks tend to arise; a secretariat team member could ask how a concept has evolved across documents and institutions over time; and a donor government could ask which organizations appear most central or most active on a specific issue. In each case, the digital infrastructure would synthesize documentary evidence, map institutional linkages, and surface relevant patterns in ways tailored to different user needs. By making the multilateral system analyzable at scale, the digital infrastructure supports more informed decision-making and strengthens the alignment of diplomacy with the best available scientific evidence, consistent with the normative expectations associated with the right to science (Committee on Economic, Social and Cultural Rights [CESCR], 2020, para. 52).

From a scientific perspective, the proposed digital infrastructure provides the empirical and methodological foundations required to analyze global governance as a complex and evolving system. It addresses persistent limitations in International Relations research. Existing theories often rely on stylized representations of actors and institutions (i.e., states as unitary rational agents, international organizations as forums or constraints). Yet global governance is vastly more granular, comprising thousands of interlinked resolutions, treaties, and soft-law instruments, overlapping mandates, and networks of experts and non-state actors whose influence is difficult to trace with conventional methods. Much of the empirical work in this field still relies on cross-sectional snapshots or short time series. But global governance unfolds over long horizons, with threshold effects, and feedback loops that can push systems into self-reinforcing vicious circles. Once such tipping points are crossed, incremental adaptation, often framed as resilience and adaptive capacities, may no longer be sufficient, and recovery may become difficult, slow, and politically costly. This helps explain why linear

models struggle to capture norm diffusion and systemic change, and why we still lack robust tools to anticipate tipping points or manage cascading effects before they become irreversible (Ruhl & Ruhl, 2022). The infrastructure addresses this gap by enabling large-scale, longitudinal, and relational analysis of governance structures, institutional interactions, and processes of systemic change as a complex system.

The literature acknowledges that issues like climate, health, or trade are governed by overlapping and sometimes contradictory institutional arrangements (Alter & Meunier, 2009; Davis, 2009; Eilstrup-Sangiovanni & Westerwinter, 2022; Keohane & Victor, 2011; Holzscheiter et al., 2024). Important advances have already been made in the comparative study of how institutional design shapes decision-making performance across international organizations (Sommerer et al., 2022). However, current empirical approaches remain uneven and only partially capture how institutional complexity operates in practice across documents, mandates, actors, and issue linkages. Researchers have generated valuable insights into voting patterns, institutional design, and organizational output, but they still less frequently combine these advances with large-scale analysis of the substantive content, intertextual evolution, and cross-institutional circulation of policy documents. Global governance outcomes are frequently emergent, arising from the interaction of many decisions rather than any single actor's intention (i.e., system-level phenomena that reductionist approaches struggle to explain or anticipate).

A third dimension of impact lies in strengthening science diplomacy as a key interface between knowledge production and diplomatic practice. By enabling better linkages between data on global challenges with data on governance responses, the platform operationalizes science diplomacy as a structured process of integration between scientific evidence and multilateral decision-making. In doing so, it helps bridge the longstanding separation between the natural and social sciences, allowing insights on biophysical processes, technological change, and societal dynamics to be analyzed in conjunction with legal and institutional arrangements and policy outcomes. This integration enhances the capacity to assess governance effectiveness and supports more coherent, evidence-informed responses to complex global challenges.

Global challenges such as climate change, pandemics, and biodiversity loss require governance responses informed by evidence from the natural sciences as well as the social sciences and humanities. Yet the worlds of scientific research and multilateral negotiation often operate in parallel, with limited integration. The platform will enable systematic linkages between data on the issues to be governed (e.g., epidemiological trends, environmental indicators, technological developments) and data on the governance systems addressing them, including resolutions, commitments, and institutional arrangements. This integration makes it possible to assess whether multilateral responses are commensurate with the scale of the problems they address, identify gaps between scientific consensus and policy action, and trace how scientific knowledge is translated (or fails to be translated) into normative frameworks.

To be actionable, these insights must be made available in accessible and decision-oriented formats, including dashboards, short analytical briefs, comparative snapshots, and traceable drafting support. This would allow diplomats, secretariats, and coordination units not only to better understand the multilateral system but also to adjust negotiation strategies, identify implementation gaps, detect inconsistencies across mandates, and revise institutional responses in light of new evidence. Ultimately, the value of the digital infrastructure lies not only in improving understanding, but in enabling more adaptive practice. By supporting faster sense-making, better coordination, and iterative learning under conditions of uncertainty, it contributes to more adaptive forms of global governance.

6 Recommendations

Realizing the diplomatic, scientific, and science diplomacy benefits outlined above requires a coordinated set of investments and institutional innovations to support the digital infrastructure for multilateralism. The following recommendations translate the proposed approach into actionable priorities, focusing on three mutually reinforcing components: sustained financial commitments to digital public infrastructure, the development of interoperable data standards, and the establishment of a robust interface between science and policy to ensure effective integration of evidence into multilateral diplomacy. Together, these elements aim to ensure that the datafication of multilateralism is not only technically feasible, but also institutionally embedded, scientifically grounded, and supports more adaptive, evidence-informed forms of global governance.

6.1 Investments

Member States should invest in the digital infrastructure needed to support more effective multilateral cooperation. This includes support for three core pillars: (1) the continuous development, operation, and maintenance of the infrastructure; (2) the datafication of multilateralism across several priority policy areas, together with the associated interdisciplinary research required to generate robust analytical methods and actionable evidence; and (3) the design, communication, and long-term maintenance of user-oriented interfaces, visualization tools, and outreach mechanisms. **We estimate that an international investment of CHF 28 million over five years would provide an indicative order of magnitude for these three pillars**. This preliminary estimate is based on benchmarking against comparable digital public infrastructure, data platform, and research-computing initiatives, and should be understood as an order-of-magnitude assessment rather than a fixed cost projection.

While this investment would benefit from a coordinated approach, we argue that the provision of this public good is best described as a single best effort (Barrett, 2010) that can be fulfilled by a small coalition of willing countries, in line with broader understandings of science diplomacy as operating through variable-geometry and multi-layered arrangements rather than through a single centralized institutional format (Turchetti & Lalli, 2020). Countries that support multilateralism will become digital host states, helping to shape a trusted digital public good and strengthening their role as conveners and standard setters for multilateral cooperation. Access to the platform and its core tools should, however, remain as open and broad as possible, so that non-funding states and multilateral institutions can also benefit from the infrastructure, subject where necessary to clearly defined governance, security, and data-protection safeguards. The physical and legal hosting of this infrastructure should be designed in a way that is compatible with data sovereignty requirements, institutional neutrality, and long-term stewardship.

This funding would cover three core tenets: (1) the continuous development, operation, and maintenance of a digital and AI infrastructure, accounting for approximately 30-35% of the annual budget (around CHF 1.8-2.0 million per year), including high-performance computing, data pipelines, security, and technical support; (2) the datafication of multilateralism across several priority policy areas, to be selected through transparent and reviewable procedures on the basis of governance relevance, feasibility, and expected public value, representing roughly 35-40% of the budget (around CHF 2.0-2.1 million per year), together with the associated interdisciplinary research required to generate robust analytical methods and actionable evidence; and (3) the design, communication, and long-term maintenance of user-oriented interfaces, visualization tools, and outreach mechanisms, funded at approximately CHF 1.5-1.6 million (25-30%) per year, ensuring accessibility and collaboration with multilateral institutions, diplomats, and researchers. The costs of creating the foundations for this digital infrastructure are modest compared to those of physical infrastructure projects, yet the potential returns are substantial for multilateralism, including through shorter document-retrieval and drafting times, improved detection of overlaps and inconsistencies across mandates, wider use of shared analytical resources across institutions, and stronger capacity to monitor change and adapt strategies over time.

6.2 Developing standards

The development of data science standards for interoperability is a prerequisite for systematic, comparative, and longitudinal analysis of the multilateral system. International Geneva is well-positioned to facilitate the launch of such a coordination agenda by leveraging its concentration of multilateral institutions, standard-setting actors, and research capacities as a convening space for early alignment on interoperable data practices. Relevant experience already exists within the UN system, including through UN Global Pulse, which illustrates how data-driven innovation can be developed as a public-interest resource and scaled beyond isolated pilots (Launiala, 2026).

However, at present, most international organizations (IOs) maintain institution-specific metadata schemas, document identifiers, classification systems, and publication formats, reflecting their historical mandates, legal traditions, and administrative practices. Even within the United Nations system, bodies such as the United Nations General Assembly, the United Nations Security Council, and the Economic and Social Council operate with partially divergent document symbol conventions, agenda structures, and dissemination workflows. Across the broader multilateral landscape, including specialized agencies, treaty bodies, and international financial institutions, heterogeneity is more pronounced, spanning inconsistent metadata fields, non-standardized citation practices, variable levels of machine readability, and fragmented archival infrastructures.

This institutional pluralism seriously constrains large-scale computational analysis and hinders the tracing of normative diffusion and policy coherence. Establishing interoperable data science standards such as optical character recognition and document parsing pipelines, canonical identifiers, cross-organizational ontologies (cf., for example, https://unsceb.org/unsif-akn4un), version-controlled metadata schemas, and machine-actionable publishing protocols is a prerequisite for the structured integration of heterogeneous corpora and for advancing the study of multilateral governance as a complex, evolving system. These choices are not purely technical. Decisions about curation, ontology design, metadata structure, and ranking systems shape what becomes visible, comparable, and actionable within the multilateral system (Bowker & Star, 1999; Gillespie, 2014). They also reflect the priorities of epistemic communities and broader processes through which knowledge and governance are co-produced (Haas, 1992; Jasanoff, 2004).

6.3 Strong interface between science and policy

A strong articulation with research ensures that the digital infrastructure will remain innovative, generating new methodologies, analytical tools, and insights that keep pace with evolving needs. Beyond its scientific and diplomatic value, the initiative will create skilled employment opportunities in data science, computational social science, and AI development, contributing to the knowledge economy. A critical element of these initiatives is their collaborative nature, bringing together scientists, diplomats, and partners in international affairs and beyond to create a data and technological ecosystem that is both useful and sustainable. Civil society organizations should also be part of this emerging ecosystem. Many of them contribute field-based evidence, monitor policy implementation, and help connect ground-level realities with multilateral policy processes, thereby strengthening the empirical foundations, inclusivity, and practical uptake of shared standards and data infrastructures.

In terms of governance, three potential options, each with distinct advantages and trade-offs, are considered below. The first option would involve creating a new foundation dedicated to the datafication of multilateralism, with the advantage of establishing a clear mandate, independent governance, and a neutral institutional home that could facilitate trust among diverse stakeholders. A second option would draw on existing organizations, combining the expertise and credibility of academic institutions with the nimbler administrative structure of an established foundation, thereby reducing start-up costs and leveraging existing capacities and governance mechanisms. A third option would involve a consortium-based model, in which partner institutions retain their autonomy while coordinating through a joint steering committee. While the optimal organizational model depends on multiple factors, the initiative should be coalition-based to ensure both societal relevance and scientific rigor, to maintain operational agility, and effectively engage the diplomatic ecosystem in International Geneva and beyond.

6.4 Immediate next step: convening a multi-stakeholder event

As an immediate next step, a multi-stakeholder event should be convened to initiate a structured dialogue on the datafication of multilateralism. This event would bring together Member States, international organizations, research institutions, technical experts, and relevant non-state actors to (1) build a shared understanding of the strategic value of

digital infrastructure for multilateral governance, (2) identify priority policy areas and pilot use cases, and (3) explore options for financing, governance, and institutional anchoring of this initiative. Such a convening should be designed as an inclusive platform for alignment and coalition-building, allowing interested states, including potential "digital host states", to articulate commitments and explore variable-geometry approaches to implementation. It would also provide a basis for establishing a roadmap for coordinated investments, standard-setting efforts, and the strengthening of science–policy interfaces. As part of this process, participants could mandate the creation of a technical and scientific working group tasked with developing initial proposals on interoperable standards, data architectures, and governance models.

A high-level forum under the auspices of the United Nations represents one high-value option within this broader convening strategy, particularly for securing political visibility and endorsement. International Geneva offers a particularly suitable location, given its concentration of multilateral institutions, standard-setting bodies, and scientific and technical expertise, as well as its established role as a hub for science diplomacy. Anchoring the process in such a setting would also enhance legitimacy, ensure inclusiveness, and facilitate alignment with existing initiatives. A key outcome of this process could be the adoption of a resolution by the United Nations General Assembly, formally recognizing the strategic importance of digital infrastructure for multilateral governance and mandating further steps toward its development and implementation. Beyond agenda-setting, the event should aim to produce concrete outputs, including a joint statement of intent, an indicative investment framework, and a timeline for pilot implementation. By combining political engagement with technical coordination, this initial step would help translate the proposed recommendations into an operational pathway toward more adaptive, evidence-informed multilateral governance.

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