FROM COOPERATION TO CONTESTATION: THE NORMATIVE TURN IN SCIENCE DIPLOMACY (2010–2025)

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Abstract

Between 2010 and 2025, science diplomacy experienced a multidimensional transformation, shifting from a predominantly technical function into a strategic domain situated at the intersection of global governance, ethical imperatives, and political complexity. Initially shaped by efforts to institutionalize cross-border scientific cooperation, the field gradually expanded to address normative concerns such as epistemic equity, inclusive participation, and open access to knowledge. Catalyzed by crises, including the COVID-19 pandemic, vaccine disparities, and contested regimes of data governance, science diplomacy evolved into both a platform for international collaboration and a space of geopolitical contention. The implementation of the UNESCO Recommendation on Open Science in 2021 played a key role in reinforcing values-based governance and promoting diversified knowledge ecosystems. Over time, a broadening array of actors, including academic institutions, municipal bodies, Indigenous networks, and youth movements, has contributed to decentralizing and reshaping diplomatic engagement. In parallel, the strategic instrumentalization of science through data nationalism, sanctions, and digital infrastructure control underscored the growing entanglement between scientific practice and geopolitical rivalry. As a result, science diplomacy has emerged not only as a means for responding to transnational challenges but also as a contested arena in which the principles, ownership, and direction of global knowledge governance are being actively negotiated.

Keywords

Normative Shift, Crisis Diplomacy, Data Sovereignty, Digital Governance, Inclusive Participation, Knowledge Politics, Ethical Standards

Introduction

In the first decades of the 21st century, science diplomacy has undergone a significant evolution, emerging as a central concept within the broader field of international relations. No longer confined to its earlier, more limited function of facilitating technical or scientific exchanges across borders, it has grown into a strategic diplomatic space. In this space, global knowledge circulation intersects with debates on ethical governance and the development of shared international norms. This transformation has been catalyzed by a series of overlapping and complex global challenges ranging from health emergencies like pandemics and the escalating climate crisis to the disruptive impacts of artificial intelligence, growing disputes over data sovereignty, and the use of scientific collaboration as a tool for political leverage through sanctions. These developments have destabilized the long-held assumption that science operates as a neutral, universal, and apolitical domain. As a result, science diplomacy has become not only more politicized and infused with normative concerns but also increasingly inclusive, involving a broader array of actors and perspectives.

Since around 2015, the focus of science diplomacy has shifted significantly. Rather than concentrating solely on the delivery of scientific expertise in moments of global crisis, it has begun to grapple with more foundational and structural questions: Who has the power to produce scientific knowledge? Who controls its distribution and benefits from its application? Under what governance models should science be regulated and shared across borders? In addressing these questions, science diplomacy has evolved into an arena defined by ethical consciousness, epistemic justice, and pluralism where competing visions of global knowledge production and governance are negotiated and contested (Turekian & Gluckman, 2024; UNESCO, 2021).

It is within this broader transformation that the period from 2015 to 2025 stands out as a critical juncture in both the theoretical redefinition and institutional restructuring of science diplomacy. Earlier conceptions, which primarily viewed science diplomacy as either scientists supporting foreign policy objectives or diplomatic efforts enabling international research partnerships, no longer capture the full scope of the field. In the past decade, complex global disruptions including the COVID-19 pandemic, emerging regulatory challenges around artificial intelligence, geopolitical struggles over vaccine distribution, and deepening anxieties about the security of scientific knowledge have prompted a fundamental reassessment of what science diplomacy is and what it ought to do (Krasnyak, 2022; Flink & Ruffin 2019).

These developments reveal the inadequacy of purely technocratic approaches and point to the need for a deeper engagement with value-driven principles, such as inclusivity, openness, and the recognition of historically marginalized knowledge systems (Varela, 2024).

One of the most notable shifts during this period is the diversification of actors involved in shaping science diplomacy. Once the near-exclusive domain of national governments and intergovernmental organizations, it is now increasingly co-produced by universities, local authorities, civil society networks, Indigenous communities, and youth-led

platforms. These stakeholders operate across multiple levels (local, national, and global) and often engage with specific thematic issues such as climate action, digital governance, or health equity. Their inclusion has contributed to a more decentralized and participatory form of science diplomacy. In this context, frameworks such as the UNESCO Recommendation on Open Science have served as key normative anchors, promoting a view of knowledge as not only a public good but also as a resource that must be governed with cultural sensitivity, fairness, and ethical accountability (UNESCO, 2021; European Commission, 2022).

This study aims to chart the trajectory of science diplomacy across the past decade, identifying four critical phases: 2010-2015, 2015-2018, 2018-2022 and 2022-2025. It also offers forward-looking reflections on the emerging trends likely to shape the 2025 - 2030 landscape. Through this analysis, the study highlights how science diplomacy has responded to crises, undergone deep normative transformation, and broadened its institutional base to include a wider range of actors and agendas. Ultimately, it argues that science diplomacy should be understood not merely as a tool for facilitating international scientific collaboration but as a central mechanism for governing global knowledge, ensuring ethical responsibility, and fostering inclusive and strategic engagement in a world defined by multipolar power dynamics.

The Conceptual Foundation, Institutional Emergence and Early Global Practices of Science Diplomacy (The 2010 – 2015 Period)

Between 2010 and 2015, science diplomacy began transitioning from a soft power narrative into a structured interface linking scientific knowledge with international policymaking. This phase marked both the theoretical maturation of the concept and its formal incorporation into foreign policy institutions across the globe. The foundational framing of science diplomacy was laid out in the landmark report "New Frontiers in Science Diplomacy" published jointly by the Royal Society and the American Association for the Advancement of Science (AAAS) in 2010 (Royal Society & AAAS, 2010).

The report proposed a three-pronged functional framework: science in diplomacy, where science supports foreign policy goals; diplomacy for science, where diplomatic mechanisms facilitate scientific cooperation; and science for diplomacy, where science serves as a tool for dialogue, trust-building, and international engagement. This typology emphasized the dual utility of science diplomacy, both as a source of expertise and as a relational mechanism in global affairs. The report also underscored science's capacity to transcend national borders, promote long-term international trust, and serve as a universal language in times of political tension.

Following this conceptual milestone, science diplomacy was swiftly adopted into the strategic agendas of several states. The United States, through the White House Office of Science and Technology Policy (OSTP), expanded its "Science Envoy" initiative, assigning prominent scientists such as John Holdren, Bruce Alberts, and Elias Zerhouni to diplomatic roles in the Middle East, Africa, and Southeast Asia (Gluckman et al., 2017).

Germany and France followed distinctive trajectories, using bilateral research centers, scientific exchange schemes, and development aid initiatives as the backbone of their science diplomacy. Germany's outreach was channeled through institutions like Deutscher Akademischer Austauschdienst (DAAD), Bundesministerium Forschung, Technologie und Raumfahrt (BMBF), and the Max Planck Society, focusing on the establishment of research infrastructures in Global South countries. France emphasized partnerships through Centre national de la recherche scientifique (CNRS) and Institut de Recherche pour le Développement (IRD), particularly in Francophone Africa, aligning scientific collaboration with broader geopolitical and development strategies. During this time, science attachés were repositioned as not only technical liaisons but also key agents in projecting the scientific dimension of foreign policy (Mayer et al., 2020).

An equally critical dimension of this period was the increasing role of knowledge actors in shaping transnational governance norms. Rather than being passive providers of expertise, research institutions, think tanks, and epistemic communities became key intermediaries between science and policy, actively participating in the negotiation of values such as transparency, accountability, and legitimacy. In this context, science diplomacy emerged not only as a tool for advancing national interests but also as a platform where the politics of knowledge production and diffusion could be contested. Discussions around the credibility, accessibility, and strategic use of scientific knowledge grew in prominence, especially as public-private networks blurred traditional boundaries between domestic and international, technical and political spheres (Stone, 2013).

This period also marked the institutionalization of science diplomacy within academia. Starting in 2014, organizations such as AAAS and TWAS launched training programs in science diplomacy, contributing to the development of the field as an interdisciplinary intersection of international relations, science policy, public diplomacy, and global development (Fähnrich, 2015).

In summary, the 2010 - 2015 period laid the conceptual and institutional groundwork for science diplomacy. It signaled a shift from informal engagement to formal diplomatic practice, where scientists and non-state actors began to play active roles in foreign affairs. This formative phase also demonstrated that science diplomacy could serve not only as a medium for peaceful international cooperation but also as a strategic response mechanism, a platform for norm-setting, and a pillar for embedding scientific principles within global governance structures. The key characteristics of the 2010 - 2015 period are summarized in the table below.

Table 1
Key Characteristics of the Period 2010 – 2015

Dimension	Description
Overall Nature	Foundational phase, establishing the science diplomacy conceptually and institutionally.
Conceptual Milestone	2010 Royal Society & AAAS report defined three core functions of science diplomacy.
Political Context	Science seen as crucial in addressing climate, health, and nuclear challenges.
Institutional Advances	Launch of programs like the U.S. Science Envoy and the U.K.'s SIN network.
Leading Countries	The U.S., The U.K., Germany, France, and Japan led formal diplomacy initiatives.
Role of Scientists	Scientists began serving in formal diplomatic and advisory roles.
Crisis-driven Engagement	Fukushima (2011) and Ebola (2014) highlighted the role of science in crises.
Thematic Priorities	Focused on nuclear safety, public health, climate change, and infrastructure gaps.
Diplomatic Instruments	Use of attachés, envoys, joint centers, and fellowship programs.
Normative Foundations	Emphasis on open science, autonomy, fairness, and epistemic equality.
Academic Engagement	Training programs launched by AAAS, TWAS, UNESCO, and the EU.
Critical Reflections	Concerns over inequality, Western dominance, and instrumentalization.
Examples of Practice	U.S. envoys, U.K.'s SIN, and African hubs by DAAD and CNRS.
Type of Diplomacy	Multilateral, technical, normative and peace-focused.

Science Diplomacy from Vision to Tension: Shifting Functions and Fragmenting Norms (The 2015 - 2020 Period)

Between 2015 and 2020, science diplomacy experienced a notable shift in both its character and functions, transitioning from a hopeful, norm-driven framework for global collaboration into a more complex, sometimes conflicted arena shaped by strategic interests and crises. This shift was set in motion by the global policy momentum generated by the adoption of the United Nations Sustainable Development Goals (SDGs) in 2015, which reinforced the expectation that science should play a central role not only in problem-solving but also in advancing diplomacy and long-term sustainability goals (United Nations, 2015).

A key moment in this transition was the Paris Climate Agreement (2015), where scientific evidence, especially from the Intergovernmental Panel on Climate Change (IPCC), played a decisive role in shaping multilateral negotiations. The involvement of scientists as key actors in these discussions marked a shift in science diplomacy from a support mechanism to a direct instrument of norm-setting and consensus-building (Dimitrov, 2016).

In parallel, the European Union's 2016 policy framework, Open Innovation, Open Science, Open to the World, elevated science diplomacy to a strategic component of foreign policy. This vision integrated digital openness, research ethics, and cross-border knowledge governance, thereby expanding the boundaries of science diplomacy to operate across institutional, cultural, and geopolitical lines (European Commission, 2022).

Within this context, open science emerged as a powerful norm with far-reaching implications. Going beyond mere transparency, it came to represent principles such as epistemic inclusion, fair access to data, and the democratization of policy-relevant

knowledge. These values resonated particularly across the Global South, where gaps in scientific capacity and exclusion from global knowledge production had long been concerns (Vicente-Saez & Martinez-Fuentes, 2018).

Meanwhile, geopolitical actors began to embed science more deeply into their foreign policy strategies. The United States, through its Science Envoy Program, and China, via its Belt and Road Initiative (BRI), developed mechanisms for leveraging science diplomacy to support their international influence and cooperation agendas. China, in particular, fused science, technology, and infrastructure into its diplomatic engagements, suggesting the rise of a multipolar model of science diplomacy that did not rely solely on Western norms (Gluckman et al., 2017)

Institutional development was also evident at this stage. European initiatives like EL-CSID and InsSciDE offered platforms that linked academic research, diplomatic training, and policymaking, enabling a new generation of science diplomats to emerge with interdisciplinary skills and global perspectives. These efforts signaled a growing recognition of science diplomacy and a critical bridge between science and governance (Rungius & Flink, 2020).

However, this ambitious and value-driven trajectory was soon challenged by the outbreak of the COVID-19 pandemic, which began to disrupt the global order in late 2019. The crisis revealed significant tensions within science diplomacy. While public expectations for cross-border scientific collaboration and transparency soared, the realities of vaccine nationalism, delayed data sharing and scientific politicization revealed the limits of solidarity. China's delayed disclosure of the SARS-CoV-2 genome and the West's critique of this delay illustrated the geopolitical sensitivity of knowledge flows. Similarly, the initial reluctance of the U.S. and EU to fully support the COVAX initiative exposed the conditional nature of their commitment to global health equity At the same time, China's investments in laboratories, data infrastructures, and AI capabilities under the BRI framework underscored how diplomacy, science, and digital infrastructure were becoming increasingly intertwined (Krasnyak, 2022).

This period also saw rising concerns over data sovereignty**,** information security**,** and digital infrastructure governance. While the European Open Science Cloud (EOSC) promoted open, transparent data sharing mechanisms, dominant powers such as the U.S., China, and Russia opted for more sovereign, closed systems, citing risks associated with data misuse and cyber threats. This trend suggested a redefinition of science diplomacy, from an open, inclusive dialogue space to a battleground for technological and informational control. The pandemic also sharpened divisions in the international research ecosystem. Growing pressure to protect national interests in science led to the regionalization of scientific cooperation and the erosion of the principle of universality in knowledge exchange. These dynamics further deepened with emerging geopolitical conflicts, such as Russia's aggressive posture by 2020, which foreshadowed the scientific sanctions to come in the following years (European Commission, 2022).

To conclude, the years 2015–2020 represented a pivotal moment in the global evolution of science diplomacy. What began as a phase of normative advancement, inclusion and ethical governance became, by the end of the decade, a domain increasingly defined by crisis response, geopolitical rivalry and strategic fragmentation. The pandemic revealed the fragility of global scientific cooperation, while reinforcing the urgent need for resilient, ethically grounded, and institutionally integrated science diplomacy frameworks in a rapidly polarizing world. The key characteristics of the 2015 - 2020 period are summarized in the table below.

Table 2

Key Characteristics of the Period 2015 - 2020

Dimension	Description
Overall Character	A phase of transition from normative, value-oriented science diplomacy to a fragmented and crisis-tested field.
Global Drivers	Adoption of SDGs (2015), Paris Climate Agreement, geopolitical realignments, and the global impact of COVID-19.
Normative Developments	Rise of open science principles—emphasizing transparency, epistemic justice, data fairness, and inclusion.
Institutional Advancements	EU strategies (e.g., 'Open Science, Open to the World'), Horizon 2020, EL-CSID, and InsSciDE integration efforts.
Science in Foreign Policy	Science is incorporated into national strategies through mechanisms like the U.S. Science Envoy Program and China's BRI.
Strategic Practices	Deployment of vaccine diplomacy, scientific infrastructure investment, and digital influence under multilateral frameworks.
Disruptions and Frictions	Challenges included vaccine nationalism, information asymmetry, data security concerns, and scientific sanctions.
Governance Challenges	Conflicting approaches to data sovereignty, fragmented open science efforts, and competing models of infrastructure control.
Implications	Science diplomacy became a contested field balancing cooperation, ethics, sovereignty, and strategic rivalry.

Science Diplomacy between Fragmentation and Reconfiguration: Global Tensions, Ethical Agendas, and Expanding Actorhood (2020–2025)

The years from 2020 to 2025 represent a complex and dual-faced period in the global trajectory of science diplomacy. During this time, science diplomacy encountered one of its most severe disruptions while simultaneously undergoing a profound transformation in its norms, institutional logic, and actor landscape. The early part of the period was dominated by the pressures of global crises and strategic rivalries, while the later years marked a move toward reconstructing the field around ethical commitments, pluralistic participation, and new models of governance.

The onset of the COVID-19 pandemic in 2020 dramatically altered the expectations and perceived capacity of science diplomacy. As the pandemic unfolded, many observers anticipated that science and international cooperation would act as unifying forces (Turekian & Gluckman, 2023). However, the realities of the crisis revealed a very different dynamic. Global collaboration gave way to intense national competition, particularly in the distribution of vaccines, the circulation of genomic data, and the management of pandemic-related information (Krasnyak, 2022).

Expectations for transparency and solidarity were soon challenged by practices such as data hoarding, asymmetrical access to research outputs, and the politicization of scientific findings. For instance, the delayed disclosure of the SARS-CoV-2 genome sequence by Chinese authorities, and the subsequent backlash from Western actors, exposed the fragile balance between scientific openness and national interest. Similarly, the limited early engagement of the United States and European Union in vaccine-sharing mechanisms like COVAX underscored how science-based cooperation could be delayed when political priorities shifted toward domestic needs (Forman et al., 2023).

The COVID-19 pandemic reshaped the strategic use of science in foreign policy, as vaccines became central to geopolitical competition. Rather than serving merely as a symbol of scientific progress, vaccine development and distribution were instrumentalized by countries such as China, India, and Russia to strengthen bilateral ties and extend their global influence. These nations adopted differentiated vaccine diplomacy strategies targeting regions like Africa, Southeast Asia, and Latin America, often blending public health support with political signaling and soft power projection (Filipović, 2024).

Parallel to this, digital infrastructures and scientific data systems gained new prominence. Data governance issues, such as who owns data, how it is shared, and under what rules, became central to science diplomacy discourse. Concepts like data sovereignty and information security came to the forefront, particularly as scientific data became deeply integrated into artificial intelligence systems, surveillance platforms, and economic infrastructure. Geopolitical conflict further complicated the landscape. Following Russia's invasion of Ukraine in 2022, the principle of scientific universality came under renewed strain. The European Commission swiftly moved to suspend its scientific cooperation with Russian institutions under the Horizon Europe framework, and many universities across the continent began to restrict collaboration (European Commission, 2022).

Although CERN did not officially revoke Russia's membership, many other institutions began imposing formal or informal scientific sanctions. These developments exposed the growing fragility of international scientific collaboration and raised fundamental questions about the extent to which scientific activities can remain insulated from political and military conflicts. In particular, CERN's decision to terminate its cooperation with Russia and Belarus marks the beginning of a new era at the intersection of science and politics (Ali et al., 2024).

While science diplomacy during the early part of this period was shaped largely by crisis management and geopolitical fragmentation, the years following 2022 witnessed the emergence of a new narrative centered on ethical reform and structural inclusion. At the heart of this transformation was the implementation of the UNESCO Recommendation on Open Science, adopted in 2021. Unlike earlier open science initiatives that emphasized technical access to publications and data, the UNESCO framework introduced a broader normative agenda. It called for equitable participation in knowledge production, protection of scientific autonomy, integration of Indigenous knowledge systems, and the rectification of epistemic imbalances between the Global North and South (UNESCO, 2021; Turekian & Gluckman, 2023).

During this period, science diplomacy became increasingly entangled with debates over the value, control, and governance of scientific knowledge. Rather than functioning solely as a mechanism for technical collaboration, it began to reflect deeper political and strategic considerations, including who defines research priorities, who benefits from scientific outputs, and how legitimacy is established. As Flink (2022) notes, science diplomacy evolved into a site where scientific authority, normative values, and geopolitical interests intersect, making knowledge governance a central concern in global science policy discourse (Flink, 2022).

In summary, the 2020–2025 period encapsulated a dynamic duality in the development of science diplomacy. On one side, the field was fragmented by crises and reframed through geopolitical securitization; on the other, it witnessed ethically motivated reconstruction, the entry of new stakeholders, and a redefinition of global knowledge governance. Whether science diplomacy can consolidate around this inclusive and value-based vision in the coming years will largely depend on the international community's ability to institutionalize participatory governance, uphold scientific autonomy, and bridge the widening gap between ideals and practical implementation (Rungius & Flink, 2020). The key characteristics of the 2020 - 2025 period are summarized in the table below.

Table 3
Key Characteristics of the Period 2020 - 2025

Dimension	Description
Overall Character	A dual-phase period marked by geopolitical fragmentation and emerging efforts for ethical reconfiguration.
Major Global Events	COVID-19 pandemic, vaccine nationalism, Russia's invasion of Ukraine, and scientific sanctions.
Normative Milestones	UNESCO's Recommendation on Open Science (2021) emphasized equity, openness.
Strategic Trends	Science used for national interest; vaccine diplomacy and digital sovereignty gained prominence.
Governance Shifts	Movement from intergovernmental models to stakeholder-driven and thematic platforms.
Actor Diversification	Increased participation from universities, cities, NGOs, Indigenous and youth groups.
Institutional Innovation	New forums and councils (e.g., AI for Humanity, Arctic Council) redefined science-policy interfaces.
Scientific Data Politics	Conflicts over data sharing, security concerns, and closed infrastructure models by major powers.
Key Implications	Science diplomacy is redefined as a field of ethical negotiation, strategic rivalry, and pluralistic governance.

Possible Developments in Science Diplomacy Between 2025 and 2030

The 2025–2030 period is projected to be a phase in which the role of science diplomacy in global governance will further expand, an expansion that will intertwine not only with technical dimensions but also with political, ethical, and societal aspects (Turekian & Gluckman, 2023). In this process, science diplomacy is expected to evolve around three main axes:

(i) diplomacy shaped by digitalization and artificial intelligence,
(ii) the institutionalization of multi-actor networks in scientific governance, and
(iii) crisis-oriented, equitable, and inclusive norm production.
Firstly, science diplomacy will increasingly become data-driven, digital, and supported by artificial intelligence. The dual nature of advanced technologies such as AI, quantum computing, neurotechnology, genomic medicine, and digital infrastructures as both drivers of scientific progress and subjects of global regulation will transform science diplomacy into a strategic instrument for creating international norms in these areas. For instance, the acceleration of multilateral negotiations on AI governance will necessitate balancing national strategies with global ethical frameworks. Concepts such as information security, digital sovereignty, and algorithmic justice will be integrated into the normative domain of science diplomacy (Mayer et.al. 2023).

Secondly, science diplomacy will increasingly operate through institutionalized multi-stakeholder governance mechanisms. States, universities, research centers, municipalities, Indigenous communities, youth organizations, and the private sector will seek representation in joint diplomatic platforms (Varela, 2023).

In this process, mechanisms such as science attachés and science envoys are expected to diversify, with greater efforts to integrate the science-based international relations of universities and cities into formal diplomacy. Additionally, new science diplomacy platforms are anticipated to be established, particularly under the leadership of countries in the Global South, where equal participation in knowledge production becomes a normative demand (UNESCO, 2021; European Commission, 2022).

Thirdly, science diplomacy will increasingly be defined as an ethical responsibility domain aimed at producing collective and just solutions to global crises, such as climate change, food system collapses, new pandemics, and climate-induced migrations (Turekian & Gluckman, 2023). Scientific collaboration models will come to the forefront, and science will be recognized not only as a field that offers solutions but also as one that bears responsibility for the governance of technologies. In this context, science diplomacy will assume functions beyond data sharing and technical cooperation that will play a role in preventive policy design, joint crisis scenario building, and the development of multilateral scientific ethics (Flink, 2022).

Furthermore, the risk of science diplomacy becoming increasingly geopoliticized may rise over the next five years. The intensifying U.S.-China rivalry in areas such as space, artificial intelligence, and biotechnology may suppress opportunities for scientific collaboration and trigger scientific polarization in a multipolar world. While such developments may threaten the peace-building potential of science diplomacy, they will simultaneously underscore the growing need for independent, multilateral platforms based on universal scientific norms.

In conclusion, the 2025 - 2030 period will likely be one in which science diplomacy expands institutionally while also being tested by political, ethical, and technological tensions. In response, it is expected to be reshaped into a more holistic, equitable, and strategic tool of diplomacy.

Conclusion

From 2010 to 2025, science diplomacy has undergone a multidimensional transformation, evolving from a relatively narrow tool of technical collaboration into a broader mechanism for navigating global crises, shaping policy and renegotiating the governance of knowledge. This fifteen-year journey can be understood in three overlapping phases, each marking a shift in the field's institutional depth, strategic function, and normative orientation.

During the initial phase (2010-2015), science diplomacy gained conceptual clarity and institutional legitimacy. This period was defined by foundational policy documents (Royal Society & AAAS, 2010) report, which established the now-familiar triad of science in diplomacy, diplomacy for science, and science for diplomacy. The field remained largely state-driven, with leading nations launching formal mechanisms like science envoy programs and innovation networks, often in response to pressing global issues including nuclear safety, public health, and climate change.

In the following years (2015-2020), science diplomacy became more entangled with strategic concerns and power asymmetries. While multilateral frameworks such as the SDGs and the Paris Agreement affirmed the role of science in global governance, the rise of vaccine diplomacy, digital infrastructure politics, and fragmented data governance introduced new tensions. The outbreak of COVID-19 underscored these challenges, exposing how national interests often override collective scientific ideals. Rather than serving solely as a conduit for collaboration, science diplomacy increasingly functions as a tool of influence, competition, and security-driven positioning

The most recent phase (2020–2025) has been marked by efforts to reconfigure science diplomacy around ethical principles and inclusive participation. The UNESCO Recommendation on Open Science (2021) has played a central role in this shift, advocating for equitable knowledge production, recognition of Indigenous epistemologies, and open, community-based scientific practices. Alongside these normative changes, the landscape of actors has significantly diversified. Universities, municipalities, civil society organizations, youth alliances, and philanthropic foundations have emerged as active participants, challenging traditional state-centric models and broadening the diplomatic ecosystem.

Together, these developments reflect a deeper redefinition of science diplomacy, not merely as an instrument for advancing national or collective interests, but as a dynamic arena in which fundamental questions About the Authority, legitimacy, and justice in science are negotiated. The field now spans issues of digital sovereignty, infrastructure access, and the ethics of data governance, with increasing emphasis on transparency, pluralism, and cross-sector collaboration.

Looking forward, the resilience and legitimacy of science diplomacy will depend on its ability to institutionalize inclusive and value-driven practices while maintaining its relevance in a geopolitically fragmented world. Its future lies in bridging the gap between scientific universality and political particularism, reimagining diplomacy not only as a response to crisis, but as a proactive platform for equitable and sustainable knowledge exchange.

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