EUTOPIA
REVIEW

3

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n. 3

Science Diplomacy

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Table of Contents

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Towards a Theory of Science Diplomacy. From Robert Merton to the epistemic communities

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When I met Luk Van Langenhove six years ago, one of the first things we discussed was the continuous need for social theory. In academia, in our roles as vice presidents (both of us at the time), in the impact of universities on society, and especially in the new trends and perspectives we embrace in our research. For example, Luk devoted part of his time to positioning theory. For my part, I was developing the idea of discursive appropriation. Our approaches, which were quite disciplinary in nature, converged in particular in our efforts to "form an alliance," to build EUTOPIA alongside our presidents and fellow vice presidents, not only by facilitating contacts between various colleagues, but also by giving it body, soul, and method.

I still remember the document shared online in which we described EUTOPIA as being united by a single method—that of science diplomacy (SD). This aspect was then incorporated into the alliance consolidation project, named EUTOPIA MORE (2022-2026). The role of universities and European alliances in science diplomacy had been announced by Van Langenhove and Burgelman (2021) and seemed to us to be a necessity in our alliance (Piaget, Radut-Gaghi, 2025b). Together with several colleagues from the alliance, including Sergiu Miscoiu, Adina Fodor, Helène Rufat, and Sica Acapo, we conducted research to understand the scope of possible scientific diplomacy actions in close collaboration with the AUF, which is also focusing its attention on this area (Piaget, Radut-Gaghi, 2025a). With

EUTOPIA joining the EU Science Diplomacy Alliance, membership in the peer community is now complete.

From now on, including in this issue of *EUTOPIA Review*, our goal is to contribute to knowledge about science diplomacy, to advance thinking about its various applications, and to propose useful avenues for clarifying the concept and broadening understanding of its reality. This article offers a theoretical investigation and places scientific diplomacy in the tradition of the sociology of science and the sociology of knowledge, before incorporating it into studies on epistemic communities.

Knowledge, savoir[1]*, science*

When Robert King Merton wrote *Paradigm for the Sociology of Knowledge* in 1945, the world was emerging from World War II with fewer certainties and more conflicts.

> "With increasing social conflict, differences in the values, attitudes, and modes of thought of groups develop to the point where the orientation which these groups previousely had in common is overshadowed by incompatible differences." (Merton, 1996, [1945], p. 205)

The American sociologist analyses the consequences of these "incompatible differences" in the development of "distinct universes of discourse" on the one hand, and in "challenges [in] the validity and legitimacy of the others" on the other, and finally in the "reciprocal distrust between groups." (*ibid*., Merton underlines).

Reading this description of societal tensions inevitably brings to mind our own era. While Merton's analysis is primarily rooted in a national context, its application 80 years later is certainly global. Real or perceived differences in

1. Here we maintain the distinction between knowledge and *savoir* that exists in French. The latter encompasses the collective and scholarly dimensions.

ways of thinking, opinions expressed, and positions taken seem to be tearing societies and democracies apart, subjecting them to continuous or repeated conflicts. That said, differences in positions and conflicts have always existed and have shaped the Western societies in which we live. The struggles for women's rights, student revolts, and democratic uprisings have challenged the status quo in order to move societies toward what is considered more just, egalitarian, and democratic.

But the 21st century brought with it new challenges and tensions that had been largely avoided in the 20th century: open distrust of established scientific knowledge. Public discourse denying scientific knowledge, public measures against scientific institutions, and sceptical currents within scientific groups themselves are a fairly unprecedented context in which we are evolving. Perhaps strangely enough, it has also helped to bring scientific reality itself to the forefront (from the status of its members to their public presence and research budgets).

If we follow Merton's thinking and place the analysis here in its functionalist perspective, any "idea" is inseparably and "functionally" linked to a substratum: "relations of production, social position, basic impulses, psychological conflict, interests and sentiments, interpersonal relations, and residues" (*ibid.*, p. 206). If we consider science itself, this falls within the realm of the "sociology of science." The rise of science is compatible with certain characteristics of the society in which it emerges: liberal environments contribute to its development, while totalitarianism hinders it (Merton, 1938). Or, in line with Max Weber, puritanical societies are more open and conducive to the development of science.

Methodically, Merton identifies two sources of hostility towards science. The first is logical, with or without empirical basis, and stipulates that "the results or methods of science are inimical to the satisfaction of important values" (*ibid.*, p. 278). The second contains non-logical elements and is based on "the feelings of incompatibility between the

sentiments embodied in the scientific ethos and those found in other institutions" *(ibid.)* Aligning "sentiments", "ethos", and "institutions" seemed entirely relevant in 1938 and is even more so today on the world stage.

If we translate "idea" to a more general level, including the "idea" of opposition to science that we have identified as characteristic of our era, we need to place ourselves at the level of the "sociology of knowledge." At this level, Merton's analysis is generous and places all types of "truth" on the same level of constraint as science:

> "The sociology of knowledge came into being with the signal hypothesis that even truths were to be held socially accountable, were to be related to the historical society in which they emerged." (Merton, 1945, p. 207)

There would therefore be two levels – that of the sociology of science and that of the sociology of knowledge. If we accept that public attacks on science fall within the latter, it would be acceptable to consider that counterattacks, or more simply, all measures to promote science, also fall within the sociology of knowledge.

Scientific diplomacy is one such measure, method, or process for advancing public, diplomatic dialogue through or by means of science. Let us test the paradigm for the sociology of knowledge formulated by the American sociologist on the "idea" of scientific diplomacy in order to account for its theoretical potential.

Towards a Paradigm for the Sociology of SD

The first of the five elements of Merton's analytical framework concerns the location of "the existential basis of mental productions." Several elements must be taken into consideration for this analysis. Among the "social bases", it is clear that SD is the product of academic groups, diplomatic actors, and institutional leaders. A single person

may sometimes belong to several possible groups, and, following Menneheim, Merton recognises that "the problem becomes one of determining which of these affiliations are decisive in fixing problems, models of thought, definitions of the given, and so on" (Merton, 1945, p. 212). If, due to its novelty, SD has accepted a multitude of contributions from different backgrounds, perhaps its foundations can only be fully defined through a careful analysis of the constitution of the community of scientific diplomats and SD experts.

Still within this first paradigmatic category, Merton cites cultural foundations, which can consist of values, ethos, climate of opinion, Volkgeist, cultural mentality, etc. Of course, SD has existed since societies have existed. But the founding texts of SD emerged 20 years after the fall of the Berlin Wall and 10 years after the unipolar world's decade, at a time when the multipolar world was in full swing. The early 2010s saw the end of the 2008 financial crisis, the Arab Spring (2011-2013), and the economic rise of countries such as China, Brazil, and India. Finally, it was the beginning of the hyperconnected world. It seems obvious that this specific context has favoured the rise of SD.

The second element of Merton's paradigm asks, "What mental productions are being sociologically analysed?" In other words, what does SD produce? This simple question seems to be one of the most complicated in this field. I mentioned earlier how SD is conceived as a method—at least in the case of EUTOPIA. In most of its definitions, SD is characterised by what it does or should do, rather than what it is. In the famous 2010 AAAS report, the term "use" is used:

> "'Science diplomacy is the use of scientific interactions among nations to address the common problems facing humanity and to build constructive, knowledge-based international partnerships.' Dr Nina Federoff, Science and Technology Adviser to the US Secretary of State." (AAAS, 2010, p. 2)

In the European framework of 2025, the term "instrument" is used:

> "Our vision for European science diplomacy is for it to become a key instrument in the EU's diplomatic toolbox, fostering peace, European competitiveness, and a safe, sustainable and prosperous future for all by harnessing the power of science and technology in a responsible way." (EC, 2025, p. 8).

Beyond these hesitations or lexical developments, the products of SD are: (a) Agreements, conventions, treaties, institutions, research centres, and research projects; (b) Public policies or regulations and their modification and improvement; (c) The sum of knowledge surrounding SD, which has mainly been translated into training programs to date.

This last category, to which this article itself attempts to contribute, is similar to what Merton identified as "conceptual content, models of verification, objectives of intellectual activity" (Merton, 1945, p. 208).

In this paradigmatic proposal, the third element concerns the way in which "mental productions [are] related to the existential basis." Three variants are proposed: causal or functional relationships, symbolic, organismic, or meaningful relationships, and (largely) ambiguous relationships. I briefly described above the immediate historical context of the emergence of the most recent theories of science diplomacy. Knowledge on the subject and Merton's analysis encourage us to consider that, in our case, the "productions" of SD are a consequence of historical and geopolitical changes. Whether this is a direct causality or a "predisposition"—to use the Marxist term employed by Merton—remains to be understood. It also remains to be decided whether SD is an "idea-system":

> "Idea-systems may play a decisive role in the selection of one alternative which 'corresponds' to the real balance of power rather than another alternative which runs counter to the

> existing power situation and is therefore destined to be unstable, precarious, and temporary." (*ibid.*, p. 217)

SD certainly has a role to play in the balance of power. The second dimension of SD identified in the 2010 AAAS report, Science for Diplomacy, defines diplomacy precisely as the use of science as soft power. Anecdotally, this report contains the word "power" 20 times, including 12 times in the expression "soft power." The 2025 European framework contains 64 occurrences of the word "power," and again, 12 are related to "soft power." It is still too early to conclude that SD is a "systemic idea." Furthermore, the current "imbalance" of power on the world stage makes many certainties questionable, and the right choice of cooperation alternatives fluctuates.

The fourth element of Merton's paradigm for a sociology of knowledge seems to me to be at the heart of the current issues facing SD. In the original, it is formulated as "Manifest and latent functions imputed to these existentially conditioned mental productions." In other words, why does SD exist today?

> "[T]o maintain power, promote stability, orientation, exploitation, obscure actual social relationships, provide motivation, canalise behaviour, deflect hostility, provide reassurance, control nature, coordinate social relationpships, and so on." (*ibid.*, p. 208-209)

All of this at once, and depending on the context, I would say, having quoted word for word the variants proposed in 1945. SD fulfils the functions that Merton attributed to knowledge produced in given societies. Moreover, in its case, it concerns stability, relationships, and behaviours between states and their actors.

Finally, the last element of Merton's paradigm aims at consecration: "When do the imputed relations of the existential base and knowledge obtain? a. historicist theories

(confined to particular societies and cultures). b. general analytical theories" (*ibid*., p. 209). This foundation of SD as *savoir* (theory, scientific basis), and therefore beyond knowledge (empirical, practical, tested, proven), is, in our opinion as authors of th current issue of *EUTOPIA Review*, the phase we are now entering, which is essential for recognition on a broader circle.

Towards an epistemic community on SD

All knowledge is based on expertise. The sum of knowledge surrounding SD is conveyed by a community that is now recognisable in 2025 through its participation in events, such as conferences or workshops, or its affiliation with networks like the EU Science Diplomacy Alliance or the AAAS. Analysing this group of people and its evolution would be an interesting objective in the context of a sociology of SD. Here, we consider two approaches: Merton's Insiders and Outsiders Doctrine (1972) and the more recent concept of epistemic community.

As mentioned above, it is well known that SD experts have most often been SD practitioners. For Merton, this is an "epistemological principle that the particular groups in each moment of history have *monopolistic access* to certain kinds of knowledge" (Merton, 1972, p. 243, emphasis added by the author). Or, in empirical contexts, it is a matter of "*privileged access*." This is therefore the definition of the Insider Doctrine. In contrast, and to stem the "ethnocentrism," "chauvinism," and even "balkanisation" that this can engender, the Outsider Doctrine can be formulated. Authors such as Max Weber, Georg Simmel, and Claude Lévi-Strauss, whom Merton cites, highlight "the objectivity of the stranger" or the "accomplished foreigner" in Tocqueville. Let us hypothesise here that this enlightened Outsider would be precisely the scholar, the academic, as proposed in the fourth dimension of SD (Van Langenhove & Burgelman, 2021) and discussed at length in this issue as well.

Whether we deal with insiders or outsiders in the field of SD, both form a group driven by this object of action, reflection, and study. In 1992, Peter M. Haas defined epistemic communities as a "network of knowledge-based experts with recognised expertise and competence in a particular domain or issue area" (Haas, 1992, p. 3). Both terms had already been used in the case of sub-Saharan African countries (Hornsby, Parshotam, 2018). However, while that article discussed how scientific-epistemic communities were involved in SD, our aim here is to assert that there is an epistemic community of SD.

We refer to the work of Meyer and Molyneux-Hodgson (2011), which was published almost simultaneously with the founding text on SD in 2010. These two authors emphasise several points that are very useful for understanding a potential epistemic community of SD. Firstly, there is a need to combine the epistemic community with the community of practice, which, above all, defines expertise around SD. Secondly, these communities "act with" knowledge (*ibid.*, p. 150); in other words, their challenge is to "introduce" the knowledge they have developed into the polis.

Another characteristic is that they are "manufactured and stabilised" through events, platforms, and mechanisms, such as the SD networks we mentioned. Epistemic communities are also "dynamic", subject to transformation according to the interactions and temporalities that constitute them—for example, the introduction of the fourth dimension of SD or the "regimes of action" analytical framework proposed in this same issue by Jean-François Doulet. Finally, Meyer and Molyneux-Hodgson mention the fact that epistemic communities not only produce "objects of knowledge", but also "producers of knowledge" with clearly identified professional trajectories—here, both training in the field of SD and institutional recognition of expertise in this field play a significant role.

We agree with these authors' observation that epistemic communities should be studied with an open mind and without preconceptions about their existence.

> "And instead of assuming that epistemic communities exist a priori, we must examine how they arise, how they are constructed and materialised, which requires exploring the practices, objects, metaphors, instruments, and discourses that produce and maintain these communities." (*ibid.*, p. 149)

Gradually, and at the very moment of writing this article, two certainties have become clear to us. The first certainty, or conceptual clarification, concerns the parallel between science and science diplomacy. SD is a set of issues surrounding the place and role of science (its actors, institutions, and regulations) in society. Nevertheless, SD now has scientific ambitions of its own. In order to overcome misunderstandings or claims that are open to criticism from outside, the second certainty concerns the usefulness and need for a sociology of science diplomacy to understand this field and its place in transnational disciplinary approaches (it would be difficult to see it fitting into a single or just a few selected national contexts). Allowing itself to be analysed through the prism of analytical instruments that have been verified elsewhere is proof of the maturity of SD. Our attempt in this article to mobilise established and verified concepts in the social sciences is a start. Our issue of *EUTOPIA Review* is an attempt to consolidate knowledge (and *savoirs*) around SD.

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The Regimes of Action in Science Diplomacy: New Analytical Categories

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Introduction

In 2025, the Royal Society and the American Association for the Advancement of Science (AAAS) mark the fifteenth anniversary of their now-classic report on science diplomacy (Royal Society & AAAS, 2010), while the European Commission releases the findings of a major collective inquiry on the same topic (European Commission, 2025). These milestones reflect the extent to which science diplomacy has emerged as a central concern in international relations. The proliferation of programmatic texts, often normative, illustrates the growing institutionalisation of a field now shaped by governments, international organisations, and major scientific institutions.

As the concept has expanded and gained visibility, the need for renewed analytical attention has become apparent. The early conceptual categories, such as "science for diplomacy," "diplomacy for science," and "science in diplomacy", originated in what is often termed grey literature. They provided a useful framework for policymaking and helped make the field accessible to a broad range of audiences. However, these categories now struggle to capture

1. I would like to thank for their support my colleagues at the French Embassy in Canada, especially Tanina Tala-Ighil, and the team of the Research Chair in Science Diplomacy at the University of Ottawa.

the complexity of contemporary dynamics, which involve an increasing number of actors, intensifying rivalries, and ambiguous boundaries between collaboration and competition.

Designed more as instruments of legitimation than tools of analysis, these classifications emerged from institutions that support research rather than from critical academic engagement. Their explanatory power remains limited.

This article puts forward a different perspective, based on the idea that two major geopolitical developments—i.e. the fragmentation of the international system and the intensification of technoscientific competition—are redefining the ways in which states, institutions, and researchers engage with science diplomacy. These shifts call for an alternative analytical grid, one that focuses on regimes of action understood as evolving configurations of actors, doctrines, and instruments (Doulet, 2025).

This approach aligns with a growing body of critical scholarship in the social sciences that emphasises the political nature of science diplomacy. Rather than a neutral interface between science and policy, science diplomacy is shaped by competing interests, strategic narratives, and power relations. It is not a universal practice but one driven by diverse, and at times conflicting, rationales.

The goal of this article is to provide both scholars and practitioners with a renewed analytical framework capable of capturing the doctrinal and strategic transformations currently at play. By treating science diplomacy as a legitimate object of inquiry within the social sciences, it offers a typology that is both analytically sound and operationally useful.

Limits of Classical Categorisations: Toward a Critical Approach

The progressive institutionalisation of science diplomacy since the early 2010s has gone hand in hand with the production of normative and programmatic categories.

These were designed to delineate the field and to facilitate its implementation in public policy. Widely disseminated following the publication of *New Frontiers in Science Diplomacy: Navigating the Changing Balance of Power* (Royal Society & AAAS, 2010), these categories are based on a binary logic that sets up science and diplomacy as two distinct domains. They imply functional relationships between the two spheres, producing formulations such as "science for diplomacy," "diplomacy for science," and "science in diplomacy." The European Commission's recent report, A European Framework for Science Diplomacy: Recommendations of the EU Science Diplomacy Working Groups (2025), adds a fourth: "diplomacy in science."

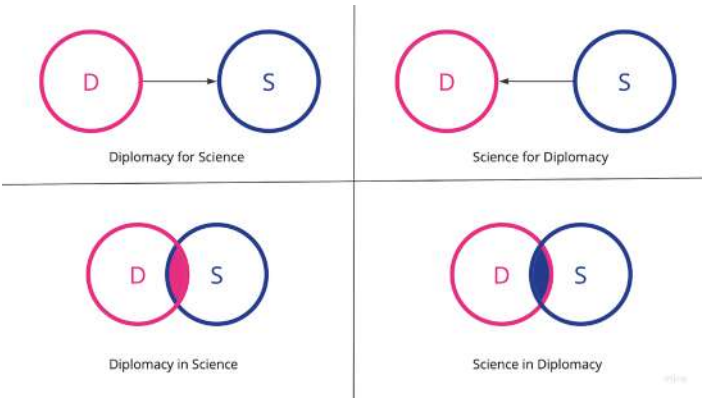

Fig. 1. The main institutional categories of science diplomacy

Three Categories That Became Reference Points

The Royal Society and the AAAS initially introduced a simple and accessible typology organised around three types of functional relationships:

* Science for diplomacy refers to the idea that scientific cooperation can foster peace, dialogue, and rapprochement between

states. International research projects embody this view that science can serve as a vector for diplomatic engagement.

* Diplomacy for science designates the range of diplomatic tools mobilised to support scientific research. These may include facilitating researcher mobility, negotiating agreements, or supporting bilateral and multilateral partnerships. This category highlights the role diplomats can play in structuring international scientific collaboration.

* Science in diplomacy describes the use of scientific expertise to inform diplomatic decision-making on global issues such as climate change, health, security, or food systems. Scientific data, expert knowledge, and academic reports are integrated into international negotiation processes.

This typology has played a significant role in making the interactions between science and diplomacy visible and intelligible. It has also helped legitimise the presence of scientists in international arenas. Nonetheless, its origins lie in institutions with a prescriptive mandate, and its function has largely been programmatic, that is, aimed at shaping policy and guiding action. The categories reflect a normative rather than descriptive vision of science's role in global affairs. Their appeal lies in their clarity, yet they tend to obscure the competitive and strategic dynamics that often underpin diplomatic practices involving science.

The European Contribution: Continuity and Expansion

In its 2025 report, the European Commission largely adopts the existing typology while introducing its own inflexion. It places particular emphasis on core European values (openness, cooperation, democracy) and on the alignment between science, diplomacy, and the European Union's geopolitical objectives (European Commission, 2025).

The report's main conceptual innovation is the introduction of a fourth category: "diplomacy in science." This new formulation reflects a significant shift in perspective. Diplomatic dynamics are no longer seen as revolving solely around science, but rather as unfolding within scientific activity itself. Scientific arenas become sites of negotiation, influence, and even geopolitical rivalry. These tensions can emerge in the governance of data, access to research infrastructures, or the development of technological standards.

This fourth category marks an attempt to update the conceptual framework in light of recent geopolitical changes. Nonetheless, it remains rooted in a functional logic and continues to carry a prescriptive orientation.

An Opening Offered by Social Science Research

These four categories were not developed through formal academic research, even though many scholars contributed to their formulation. Rather, they originate from institutions whose mandate includes legitimising the role of science in international affairs. As such, they exemplify what public policy analysts refer to as a form of instrumental normativity. While undeniably useful in popularising the concept of science diplomacy, these classifications offer only a limited understanding of the diversity of configurations observable in practice.

They fail, for instance, to account for the competitive dimension of science diplomacy, which manifests in efforts to attract talent or in state strategies aimed at enhancing national scientific and technological influence (Ruffini, 2020; Gluckman et al., 2017). These typologies are focused on the assigned functions of scientists and diplomats, rather than on the power relations or geopolitical shifts that shape those roles. As Flink (2020) notes, they tend to idealise science as a neutral driver of cooperation, with insufficient attention paid to national interests or structural asymmetries.

Over the past decade, a growing body of academic research has sought to move beyond these functionalist grids. Several authors have shown that science diplomacy is not merely an interface between science and foreign policy, but rather a distinct arena shaped by political, economic, symbolic, and geostrategic logics. These studies have highlighted the diversity of actors involved, the tensions between collaboration and competition, the conflicts over norms, and the historical depth and contextual variability of diplomatic practices in science.

This line of research invites us to understand science diplomacy as a politically situated construct, shaped by interests, representations, and institutional arrangements. It points to the hybrid nature of the field, marked by competing rationales that must be analysed in their specific contexts and trajectories. In practice, this results in highly differentiated national styles of science diplomacy (Flink & Schreiterer, 2010).

In continuity with these insights, I propose an alternative analytical framework, not based on functional categories, but on regimes of action, borrowing a concept from the sociology of public policy. The sections that follow elaborate on this approach, which aims to capture the complexity of empirical situations, to account for implicit doctrines mobilised by both state and non-state actors, and to analyse current geopolitical reconfigurations. This framework represents an effort at analytical systematisation, grounded in observable and comparable criteria, for thinking of science diplomacy as an evolving, strategic, and contested field.

Structuring Hypothesis: Two Geopolitical Trends Behind Diverging Regimes

Contemporary science diplomacy unfolds within a global landscape shaped by two major geopolitical trends. While not entirely new, these dynamics have intensified in recent years, accelerated by the COVID-19 pandemic,

the Russian invasion of Ukraine, and the mounting Sino-American rivalry over advanced technologies. Together, they have redefined the conditions under which states co-operate and compete in scientific domains.

A Shift Toward Fragmentation and Scientific Retrenchment

The first trend is marked by the resurgence of sovereignty-based logics and control-oriented research policies. Governments are increasingly implementing what they term research security measures, combining the screening of international partnerships with new oversight mechanisms for sensitive collaborations.

In Europe, the suspension of research cooperation with Russian institutions under Horizon Europe following the 2022 invasion of Ukraine symbolised a rupture with the universalist principle of open science. Beyond its political dimension, this decision proved particularly damaging to fields such as Arctic and permafrost studies, where decades of shared observation networks have been disrupted, creating critical data gaps.

In North America, Canada's 2024 Research Security Guidelines formalised this shift. By designating institutions in China, Russia, and Iran as high-risk partners in areas such as artificial intelligence and quantum technologies, Ottawa made precaution a structural component of research governance.

Meanwhile, China has restructured its international science and technology cooperation around its national priorities, developing a dense network of bilateral agreements, mostly with Asian, African and Latin American partners, framed as "win-win" collaborations. In practice, these frameworks often embed asymmetric control over research agendas and data access, contributing to the emergence of parallel cooperation spheres.

Together, these developments signal the end of the illusion of science as a borderless good. They illustrate a world

where collaboration remains possible, yet increasingly selective and segmented—a dynamic that calls for analytical frameworks attentive to the interplay of openness and strategic retrenchment.

An Intensification of Technoscientific Rivalries Between Powers

The second trend concerns the rapid politicisation of scientific and technological leadership. Artificial intelligence, quantum computing, biotechnologies, semiconductors and space systems have become the nerve centres of international power competition. Each major actor now articulates research policy in explicitly strategic terms: the U.S. CHIPS and Science Act seeks to re-industrialise semiconductor production; China's 14th Five-Year Plan integrates AI and quantum under its national security strategy; the EU's Horizon Europe and Chips Act aim to ensure technological sovereignty; France's France 2030 plan combines industrial innovation with geopolitical resilience.

Science diplomacy, once conceived as a bridge between nations, now serves as an instrument of technological influence. Talent mobility programs are used to attract or retain expertise, while regulatory frameworks and standard-setting initiatives have become vectors of soft power. The notion of technological alignment increasingly replaces that of international collaboration.

This evolution produces a paradox. On the one hand, governments still invoke science diplomacy to address global challenges, such as climate, health, oceans or biodiversity, that require cooperation. On the other hand, they deploy the same instruments to secure their strategic autonomy. The outcome is not the disappearance of multilateral science, but its transformation into a space of negotiated rivalry, where partnerships are filtered through strategic interests.

As Ruffini (2020) anticipated, the frontier between collaborative and competitive diplomacy has blurred. The technoscientific race redefines power itself, not only as the

capacity to innovate, but as the ability to set the rules of knowledge production and circulation.

The Four Regimes of Action in Science Diplomacy: A New Typology

At the intersection of the two geopolitical dynamics identified above (growing fragmentation and intensifying competition), it becomes possible to construct a typology grounded not in the functions of science diplomacy, but in its regimes of action. These regimes reflect specific institutional, doctrinal, political, and cultural configurations. They should not be viewed as rigid ideal types, but rather as archetypal states that coexist and recombine in national and international contexts.

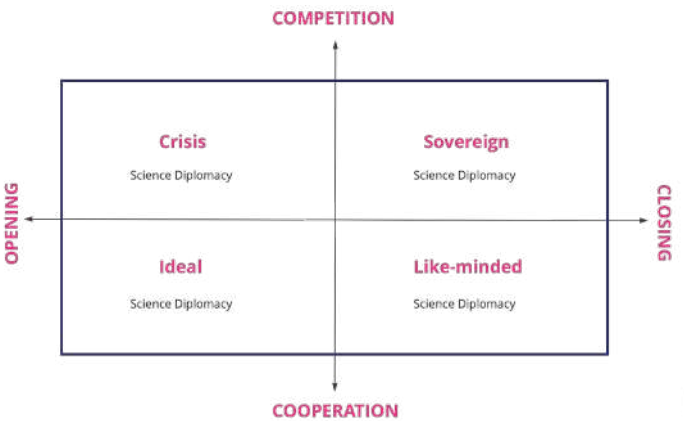

Fig. 2. The four regimes of action in science diplomacy

THE IDEAL REGIME

This regime is rooted in a cooperative, universalist, and relatively apolitical conception of science diplomacy. It rests on the shared belief that science, by virtue of its common language and rational methods, can foster peace, mutual understanding, and global progress. In this worldview, the international system is seen as fundamentally

open, and scientific exchange as a vehicle for dialogue and connectivity.

International institutions such as UNESCO, the International Science Council (ISC), and the World Academy of Sciences (TWAS) serve as the main guardians of this diplomatic vision. Initiatives such as CERN, the Antarctic Treaty (1959), and the International Space Station are emblematic of this approach.

This regime closely mirrors the foundational discourse of science diplomacy, which posits that the objectivity and neutrality of science allow it to transcend national interests and ease geopolitical tensions. Though idealised, this regime remains highly influential at the rhetorical level and continues to provide a normative reference point for many scientific cooperation policies.

THE CRISIS REGIME

In this regime, states acknowledge the strategic value of science in addressing global challenges, but often struggle to agree on the modalities of action. Openness is maintained to some degree, yet tensions between economic imperatives, national interests, and scientific urgency often make compromise elusive.

The role of experts is ambivalent. While considered indispensable, their influence is sometimes bypassed or contested. Climate negotiations provide a telling example: the Intergovernmental Panel on Climate Change (IPCC) plays a central role, but remains exposed to the shifting balance of diplomatic power.

This regime reflects the limits of scientific multilateralism in the face of realpolitik. The COVID-19 pandemic further accentuated this dynamic. Appeals to scientific authority (for vaccine development, epidemiological data, or international coordination) were entangled with geopolitical rivalries and conflicting national strategies.While imperfect, this regime nonetheless enables science to remain

central in many international negotiations. For some states, it continues to offer a space of visibility and legitimacy on the world stage. Others, however, have chosen to disengage from such multilateral arenas (as exemplified by periods of U.S. withdrawal), whereas countries like China have actively reinforced their presence within them.

THE LIKE-MINDED REGIME

In this regime, the world is perceived as fragmented into geopolitical blocs, and science becomes a marker of strategic identity. Countries prioritise targeted partnerships with allies, based on political, linguistic, cultural, or military affinities. Club-based logics multiply, as seen in the G7 dialogues on science and technology, the BRICS group, NATO's DIANA initiative, or the francophone science diplomacy promoted by the Agence universitaire de la Francophonie (AUF).

The circulation of scientific knowledge is increasingly conditioned by political loyalty. Scientific cooperation no longer operates under the assumption of universal access, but rather within selective alliances. This regime emphasises the creation of alternative technoscientific standards to support geopolitical alignment.

In this context, scientific collaboration becomes an expression of diplomatic allegiance as much as a research endeavour. The values traditionally associated with science, i.e. objectivity, openness and neutrality, are instrumentalised in the service of regional or ideological influence. This regime highlights how scientific norms can be co-opted by strategic narratives and embedded in regional power structures.

THE SOVEREIGN REGIME

In this regime, science is fully integrated into national strategies of power projection and economic development.

States invest heavily in high-potential sectors, such as artificial intelligence, biotechnology or quantum technologies, and organise their international engagement around clearly defined national interests.

Here, scientific soft power gives way to a more assertive techno-industrial hard power. Talent diplomacy becomes a central concern, with aggressive policies to attract and retain researchers. Unilateralism is no longer taboo. China and the United States exemplify this regime, although Europe and other powers are also moving in this direction.

This approach reflects a growing detachment from multilateral norms. Science is no longer presented as a global public good, but rather as a resource to be secured, mobilised, and defended. The sovereign regime embodies a realist vision in which science diplomacy serves above all as an instrument of national interest.

This configuration brings into focus the competitive dimension of contemporary science diplomacy: its orientation toward securing technological advantage, achieving normative leadership, and asserting cognitive sovereignty.

Toward a Strategic Reading of the Regimes of Action

Having described the four regimes of action, the analysis must now move beyond their mere juxtaposition. A more transversal reading reveals their systemic dynamics, underlying doctrinal foundations, and ongoing strategic recompositions. By combining the analysis of institutional structures, cognitive frames, and inter-regime interactions, it becomes possible to sketch an evolving global landscape of science-diplomacy relations.

DIFFERENTIATED CONNECTIVITY

The regimes of action differ not only in their goals and instruments but also in their degree of connectivity, that is, the density and intensity of the links they organise within

the international scientific space. This dimension is key to understanding the structural reconfiguration of cooperation networks.

The typology presented above visually reflects these differences. In the ideal regime, connectivity is dense and inclusive. In the crisis regime, it is more uneven and contingent. In the like-minded regime, it is organised around selective alliances. And in the sovereign regime, it becomes almost residual, as strategic autonomy takes precedence.

This gradient of connectivity points to a broader transformation in the ecology of knowledge production and circulation. From open and multilateral systems, the world is moving toward more fragmented, selective, and sometimes unilateral configurations. As such, the proposed typology does not simply describe distinct regimes; it also captures the structural reshaping of a global epistemic ecosystem.

DOCTRINAL ANCHORS

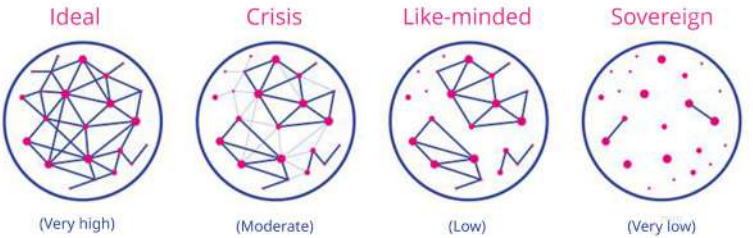

Fig. 3. The connectivity gradient across science diplomacy regimes

These regimes of action are not merely institutional configurations; they embody distinct, often implicit, doctrines regarding the role of science in international relations. Each regime is underpinned by a specific cognitive and normative frame: science as a global common good, as a tool for risk management, as a vector of political alignment, or as a lever of national sovereignty.

These doctrinal anchors are rarely made explicit, yet they shape diplomatic discourse, budgetary priorities, and

strategic agendas. They correspond to what Ruffini (2020) describes as "normative concepts" promoted by scientific communities themselves, i.e., communities often driven by idealised representations of international cooperation. In contrast, more realist interpretations (Gluckman et al., 2017; Colglazier, 2017) stress the structural alignment between science diplomacy and national interests.

Understanding these underlying doctrines helps to explain why shifts between regimes, or their coexistence, rarely follow a linear path. Instead, they generate tensions and contradictions between actors across scientific, diplomatic, technological, military, and economic domains.

The European Commission's recent introduction of the notion of "diplomacy in science", where research itself becomes an arena for geopolitical competition, illustrates this growing doctrinal hybridisation. The epistemic, the political, and the strategic now converge within the very structures of scientific production.

OVERLAPPING REGIMES

It is essential to emphasise that these regimes are not mutually exclusive. They coexist, interact, and often manifest simultaneously in the contemporary practices of science diplomacy. What is at stake is not a linear or cyclical transition from one regime to another, but rather a shifting balance of power between them within a given context.

A single country, for instance, may invoke an ideal discourse in multilateral forums, adopt a crisis posture in climate negotiations, activate like-minded networks in its bilateral relations, and structure its domestic research policy according to a sovereign logic.

Careful analysis of these overlapping configurations and the political trade-offs they involve is key to understanding diplomacy "in action." It also allows observers to anticipate possible regime shifts triggered by geopolitical or technological events that reconfigure the prevailing hierarchy.

Moreover, identifying the interplay among regimes reveals the space still available for political manoeuvre. Certain countries or institutions may choose to resist the logics of fragmentation, or to rebuild bridges between blocs, through thematic initiatives, multi-stakeholder partnerships, or South–South cooperation.

In specific conditions, science diplomacy can once again serve as an opening toward global dialogue, provided that the tension between national interest and the global public good is recognised and consciously managed.

This perspective invites researchers, diplomats, and decision-makers to engage with science diplomacy not as a unified model or ready-made solution, but as a plural and contested field. Navigating it effectively requires weighing competing regimes, deciphering their underlying doctrines, and identifying both points of friction and windows of opportunity.

Conclusion

At a time when science diplomacy is confronted with critical global challenges (from climate change and digital sovereignty to the governance of artificial intelligence), there is a pressing need for renewed analytical tools. Beneath a façade of unity, the field is in fact shaped by divergent and often competing logics that render dominant typologies increasingly obsolete.

Understanding this plurality is essential to avoid overly idealistic narratives disconnected from geopolitical realities and to develop strategies that are both coherent and clear-eyed.

This article breaks with the functionalist classifications that have dominated the field over the past fifteen years. Building on an already substantial body of academic work, it proposes to conceptualise science diplomacy as a system of regimes of action. These regimes, understood as evolving configurations of actors, doctrines, and instruments, help

to illuminate the tensions between cooperation, competition, sovereignty, and influence that structure present-day practices.

The typology offered here provides a framework for understanding the systemic transformations underway. It highlights a gradual shift from open, universalist regimes toward more instrumental, selective, and even unilateral forms. It makes visible the recomposition of underlying doctrines—from science as a common good to science as a vector of power—and clarifies how multiple regimes can coexist within a single national or thematic context.

For researchers, this framework offers a robust analytical foundation for exploring the reconfiguration of scientific multilateralism. For decision-makers, it provides a tool for designing more informed, balanced, and context-sensitive policies.

Above all, it calls for a collective effort to build a critical knowledge base on science diplomacy that is commensurate with the political, technological, and ethical challenges of our time.

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Towards a New Theoretical Framework for EU Science Diplomacy in the Vicinity of Europe

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ABSTRACT

This paper advances science diplomacy from a descriptive to a theorised field by proposing a constructivist, multi-layered framework grounded in practices, positions, and perceptions. This paper builds on European Union (EU) experience—where science diplomacy is institutionalised through research framework programmes, association agreements, and regional initiatives (e.g., PRIMA, SESAME)—and my personal positioning as a former EU Diplomat in the Middle East, observer and actor in the science diplomatic process. It argues that the existing 'three strands' of science diplomacy—diplomacy for science, science for diplomacy, and science in diplomacy—recently enriched by a fourth strand—diplomacy in science—explain little about how meanings, interests, and positions are developed, represented, negotiated, and put in action in volatile geopolitical settings such as the European neighbourhood, notably in the Middle East.

Centred on constructivism, the framework integrates practice theory (communities of practice, cognitive evolution), positioning theory (agency, rights/duties, storylines), and perception theories (direct/indirect processing and bias) to connect micro-level interaction (individuals) with meso-institutional dynamics (communities and local diplomatic bodies) and macro policy change (at the regional and EU level).

For impact assessment, the Third-Stream Activities framework is selected as the best model for investigating the impact of science diplomacy. It was empirically tested in selected Middle Eastern Countries to evaluate project networks, knowledge exchange, and technology

production, pairing qualitative insights with quantitative indicators. Completed by process-tracing, this new approach specifies also tests—straw-in-the-wind, hoop, smoking-gun, doubly decisive—to investigate causality between science-diplomacy practices and their outcomes in international collaboration and innovation.

In conclusion, the contribution of this paper is a coherent theory-method package for the study of science diplomacy, whose validity was tested in the Middle East context, and its application could stretch beyond the vicinity of Europe. It is a practical lens to analyse, compare, and evaluate science diplomacy as a policy tool and social practice in contexts marked by instability but also by the urgent need to innovate.

The theoretical gap

The relationship between science, diplomacy, and international affairs is not a new phenomenon, yet the analytical understanding of science diplomacy as a distinct domain of study is slowly developing. Over the last two decades, an expanding body of literature has explored the concept, proposing definitions, models, mechanisms, and frameworks to explain how scientific cooperation serves diplomatic objectives and, conversely, how diplomacy enables science. However, despite this growing attention, the field remains fragmented, with limited theoretical analysis to guide empirical inquiry or comparative analysis. This gap highlights the pressing need for a more robust theoretical framework that can capture the dynamic, multi-level, multifaceted, and context-dependent nature of science diplomacy.

While there is broad agreement that science diplomacy involves the strategic use of scientific cooperation, exchanges, and engagement to pursue objectives that extend beyond scientific discovery (Turekian, 2018), most existing frameworks remain descriptive rather than explanatory. The 'three strands'—diplomacy for science, science for diplomacy, and science in diplomacy —have

offered a valuable starting point (Royal Society; American Association for the Advancement of Science 2010), but they do not provide a sufficient analytical lens to understand how actors negotiate interests, construct shared meanings, and generate outcomes within complex geopolitical settings and how to trace possible dependency from individual agency and results on the ground. The absence of an overarching theoretical model limits the ability to assess science diplomacy as both a policy tool and a social practice in its own right as a new field of investigation.

In the European context, the institutionalisation of science diplomacy within EU foreign policy instruments, from research framework programmes to association agreements, provides a very interesting ground for theoretical reflection. The interplay between the EU's hard and soft powers, as articulated in the Sibiu Declaration, illustrates how science diplomacy functions as both a normative and operational instrument—bridging the domains of international cooperation, regional stability, and global leadership (Trobbiani & Hatenboer, 2018). Yet, without a coherent theoretical basis, analyses of these initiatives risk remaining confined to policy narratives or case-specific evaluations, missing the underlying mechanisms through which science diplomacy shapes behaviour, norms, and institutional change.

Recent empirical studies—from EU cooperation with Associated Countries in research and innovation (R&I) to regional initiatives such as PRIMA and SESAME—reveal the instrumental use of science diplomacy in advancing policy integration, mutual understanding, and resilience in the EU Neighbourhood. However, these examples also expose a conceptual weakness: the lack of a systematic framework that connects these practices to broader theories of international relations, policy formulation, and governance. A more refined theoretical approach is therefore required to link micro-level interactions, meso-level dynamics, and macro-level policy structures, enabling

science diplomacy to be understood as a practice part of a process rather than a functional instrument.

Recent reflections within the European Commission's Framework for Science Diplomacy have expanded the epistemic horizon beyond the traditional triple dimension, introducing a fourth one—diplomacy in science. This dimension acknowledges that diplomacy increasingly operates within the scientific domain itself, where universities, research consortia, and transnational networks act as diplomatic agents, fostering trust, shaping norms, and mediating exchanges across geopolitical and epistemic boundaries. However, while this fourth dimension represents a valuable addition to the operational understanding of science diplomacy, it remains primarily a policy and practice-oriented framework rather than a theoretical one. Its focus is on how science diplomacy can be mobilised as an instrument to achieve political and cooperative goals, rather than on explaining the underlying social, political, and epistemological mechanisms that define its design and operation. In this sense, the new European framework advances the use of science diplomacy but not its understanding as a theoretical construct. This reinforces the need for a critical and coherent theoretical lens capable of interpreting science diplomacy as a process of meaning-making and interaction, where knowledge, interests, and identities are co-constructed within a complex and evolving international system in which individuals and networks play a central and critical role through agency and interplay.

It is within this gap that a constructivist approach offers analytical depth for reflection. Building upon the work of scholars such as Van Langenhove (2017) and Bertelsen (2021), this paper argues that a new theoretical framework is essential to advance the study of science diplomacy beyond its current descriptive stage. Such a framework should integrate constructivist principles, viewing science diplomacy as a socially constructed practice that emerges from

interactions among diverse actors and is shaped by ideas, identities, and institutional settings. Constructivism, in this sense, provides an ideal lens to capture how meanings are formulated, shared, and negotiated, how norms evolve, thanks to individual agency, and how scientific cooperation contributes to the EU's role as a global actor across different communities.

Following Luk Van Langenhove (2020) investigation on the study of science diplomacy from a theoretical perspective, introducing the position theory as a pertinent framework, Rasmus Bertelsen further develops the social dimension in the theorisation of science diplomacy. In the InsSciDE Horizon 2020 supported project, Inventing a Shared Science Diplomacy for Europe, Bertelsen mentions, even though marginally, in his paper 'Social Theory and Science Diplomacy', the role of science diplomacy in supporting transnational flows of knowledge, talent, and resources from a regional perspective in the West, the Middle East, and East Asia (Bertelsen, 2024).

The main goal of this paper is thus to propose a theoretical model anchored in the 'science diplomacy cycle' as a social construct, encompassing the formulation of objectives, creation of networks, development of programmes, and their strategic communication and implementation. This model aims to connect theory with evidence-based analysis through process-tracing methodological approaches, providing a bridge between conceptual inquiry and policy assessment to establish causal relationships. By doing so, it contributes to the ongoing effort to establish science diplomacy not merely as a policy discourse but as a theorised field of study capable of explaining how scientific collaboration operates within and across political systems to foster innovation and prosperity. A new, coherent theoretical and methodological framework for the study of science diplomacy has the potential to highlight the strategic benefits of deepening science diplomacy efforts in EU international affairs, thereby reinforcing dialogue

and collaboration mechanisms between the EU and non-EU countries. The suggested framework, elaborated for the analysis of science diplomacy in the European neighbourhood, notably the Middle East, could also be transferred to other regional geopolitical contexts.

A multilayered theoretical construct for the investigation of science diplomacy

While acknowledging the limitations of generalisations, the theoretical construct suggested in this paper aims to guide the investigation of science diplomacy not only as a concept but also as a practice, based on social constructions. This approach allows the collection and analysis of evidence-based insights to shed light on the role and impact of science diplomacy as a tool for addressing shared challenges, advancing mutual interests, and promoting sustainable innovation in the European neighbourhood.

This new theoretical framework unfolds through the lens of constructivism, utilising the practice theory and positioning theory across empirical information to allow for its theoretical inlay. The framework is complemented by the Third Stream Activities framework for programmes and projects' impact analysis for the discussion of the assessment of science diplomacy initiatives and activities in relation to innovation. Finally, process tracing is introduced as a suitable empirical methodological approach for assessing the impact of science diplomacy on innovation at the regional level.

Impact assessment is based on the link between the programme impact assessment and qualitative frameworks for R&I. It shows how the outcomes of programmes and projects, during the implementation phase, influence policy-making, which then informs the priority setting of future programmes. The interplay between science, diplomacy, and international affairs is a complex phenomenon. While this framework offers a valuable lens, recurrent

evaluation and adaptation are critical to understanding the role of EU science diplomacy in dynamic geopolitical regional landscapes characterised by instability and thus subject to constant changes and evolutions.

CONSTRUCTIVISM, PRACTICE THEORY, AND POSITIONING THEORY

Considering the fluidity of the concept of science diplomacy, constructivism emerges as the most suitable theoretical framework for this research, offering a dynamic lens through which to explore the processes and interactions of individuals and networks that shape EU science diplomacy. This is the outcome of the examination of different theories and conceptual frameworks to ensure the suggested approach is the most relevant for the study of science diplomacy. Academic considerations and my former EU Diplomatic dual role as a participant observer and actor in science diplomacy inform this theoretical selection.

FROM INSTITUTIONALISM TO CONSTRUCTIVISM

While introducing the social and individual dimensions as the most suited theoretical construct for the study of science diplomacy, a better understanding of well-established theoretical frameworks applied to international affairs and diplomacy was needed. A comprehensive exploration of institutionalism, particularly its historical and new dimensions, was done to understand how political and organisational structures adapt to temporal and geopolitical contexts, while being influenced by the individuals operating within these systems (Wiener & Diez, 2009). This dynamic interaction is crucial to understanding the evolution of science diplomacy as a strategic tool for addressing global challenges and promoting international scientific cooperation.

Institutionalism offers insights into the processes through which complex organisations, such as research institutions and governments, adapt to their environments, contributing to and being shaped by policy frameworks. March and Olsen's foundational work highlighted how institutions are not passive structures but active participants that influence and are influenced by individual behaviours, norms, and historical contexts (March and Olsen 1983). These perspectives provide a foundation for examining how science diplomacy emerges as an adaptive strategy in the EU governance and international relations context.

New institutionalism, with its three streams—rational choice, sociological, and historical institutionalism—further refines this analysis. The sociological strand, which emphasises the cultural and normative dimensions of institutional functioning, is of interest and could serve as a liaison to engage with constructivism. This approach helps explain how science diplomacy evolves in response to changing political, social, and economic dynamics, both institutionally and in relation to individual dynamics as a social construct. This dynamic between institutions and individuals highlights the transformative potential of science diplomacy in achieving sustainable and impactful international cooperation.

Science diplomacy, viewed through an institutionalist lens, becomes an integral part of the EU's strategic toolkit for navigating and influencing complex global issues. For example, the EU's leadership—across international climate initiatives, renewable energy partnerships, and global health cooperation mechanisms such as the COVID-19 response—reflects its ability to leverage institutional settings to build coalitions and advance science diplomacy. These initiatives demonstrate how institutions contribute to shaping international relations while being influenced by geopolitical tensions and global challenges.

While institutionalism provides valuable insights into the political processes underpinning the evolution of science

diplomacy, it proves less effective in addressing the interplay of agency and structure at the individual and network levels, particularly in the case of an emerging new area of study. Constructivism, in contrast, prioritises understanding how identities, ideas, and behaviours influence actions and relationships. It offers a framework for studying individuals and their roles within science diplomacy, allowing me to situate myself within the research as both an observer, critically examining how networks are formed and leveraged in diplomatic efforts, and as an actor in the process of shaping science diplomatic agency and activity.

By focusing on the social construction of reality, constructivism enables an exploration of how science diplomacy networks are not merely functional entities, but dynamic systems shaped by shared values, interactions, and contextual influences. It aligns with an interpretative approach of investigation, fostering a deeper understanding of how science diplomacy operates as a tool for international scientific cooperation and innovation, shaped by the actors and networks driving its evolution. This perspective is valuable for examining the formation and operation of policy and project networks and understanding the dynamics underpinning the EU's engagement in the region.

Martha Finnemore's National Interests in International Society is foundational in constructivist theories for international relations. She demonstrates how norms and institutions shape state behaviour and define national interests. According to Finnemore, states do not act solely in the framework of material power, economic systems, and institutional frameworks. On the contrary, social constructions influence actions and priorities through interactions inside the international arena, comprised of norms and codifications, as well as shared values. Norm propagation and socialisation are affected by how international organisations operate; equally, individuals, groups, and networks impact how states set and operationalise their goals and defend their interests. This tension fosters cooperation, encouraging

states to act, pursue collective goals, find shared solutions, and improve mutual understanding (Finnemore, 1996).

Finnemore's insights are relevant to understanding the role of science diplomacy initiatives like the Framework Programmes (FPs) for R&I. These programmes, as of FP number 7 (FP7), and increasingly through Horizon 2020 (FP8) and Horizon Europe (FP9), support international cooperation between countries worldwide, transcending national boundaries to find solutions to global challenges.

Finnemore's work helps to explain how science diplomacy initiatives such as EU FPs function as norm-propagating mechanisms. To participate in the programme, scientific communities must meet and cooperate, demonstrating how their research contributes to aligning their work with EU policies and initiatives. As such, EU priorities influence the national policy frameworks of participating countries within and outside the EU. This alignment advances knowledge while also strengthening diplomatic relationships among the actors involved at the institutional, individual, and network levels. Policy frameworks activate networks, individuals and groups, stimulated by the process, and influence policies and priorities through a circular mechanism.

Constructivism not only allows the investigation of individuals' roles in science diplomacy, but it also provides the tools to analyse the dual role of networks as both drivers and byproducts of science diplomacy. In this view, the work of Ali Fisher and Karen Fierke is relevant. While Fisher focuses on the shift from traditional state-centric diplomacy to network approaches, Fierke explores the importance of social interactions, discourse, shared positions, and mutual understanding in shaping international security.

In her book *Critical Approaches to International Security*, Fierke does not explicitly focus on the concept of networks; her investigation of the social construction of security naturally ties into the role of networks as critical tools for

shaping, sustaining, and transforming security practices. The link between networks and security is magnified by Fierke's constructivism by fostering trust and sharing norms among actors. Climate change is a perfect example where networks involved shifted the focus from the purely environmental perspective to the security one, depicting it as a transformative major threat to society and the economy nationally and globally (Fierke, 2015). In Fierke's work, the role of discourse is highlighted as being central in shaping security narratives. Both policy and project networks position themselves as mechanisms for creating, disseminating and challenging these narratives, influencing how security threats are understood and addressed, driving agency and engagement at institutional and network levels.

PRACTICE THEORY

The practice theory resonates with constructivism and allows me to magnify my role as a participant observer and actor to investigate individuals and networks in EU science diplomacy. The work of Emanuel Adler (2005), Vincent Pouliot (2011), Ted Hopf (2018), and Federica Bicchi (2022) is relevant to support the design of the theoretical framework in this paper, associating concepts such as 'cognitive evolution' and 'communities of practice' to EU science diplomacy across its three strands.

While Bicchi dedicates attention to the Middle East by analysing EU diplomacy practices in sensitive places such as Jerusalem, Adler introduces the concept of evolution, where communities of practices—i.e., networks activated in international affairs—drive collective learning and adaptation. This aligns with and fully applies to science diplomacy. For example, SESAME in Jordan is an example of science diplomacy where the community of practice of scientists from diverse geopolitical backgrounds collaborate, creating shared models and advancing regional cooperation despite broader political tensions.

This approach is magnified by Adler and Pouliot in their article 'International Practices', where they investigate the concept of practices as an analytical lens to understanding international relations. Practices are not just actions but are included and shaped by meaning, rules, and social contexts; they emerge and evolve through the interplay of actors within structured environments (Adler & Pouliot, 2011). Adler and Pouliot's work allows the analysis of phenomena such as diplomacy, conflict resolution, and institutional cooperation from the perspective of the interaction of international actors in shaping and transforming the global order through behavioural patterns. Focusing on practices makes their work relevant for studying science diplomacy, where international practices shape the tension between communities, policy networks, and state actors.

Equally, Ted Hopf explores practices from the perspective of evolution over time, examining mechanisms that can inform change in social structures and global politics. In his article 'Change in International Practices', Hopf highlights that international practices are not static but subject to transformation through innovation, opposition, support, and contestation. The role of agents is critical in generating interaction in broader social and cultural contexts, activating change (Hopf, 2018). This approach integrates constructivist and practice theory, as the evolution of practices mirrors the changes in the collective understanding and behaviour of international actors. This paper is situated within this integration, examining a dynamic and recent phenomenon, such as science diplomacy, where evolving practices—that I have witnessed and been involved in—contribute to informing and shaping research collaborations, policy engagement, and diplomatic dialogues.

Originally developed by Étienne Wengervand and Jean Lave in the early 1990s, the concept of 'communities of practice' is analysed and employed by Federica Bicchi as an innovative theoretical framework applied to global

diplomacy and cooperation. She provides new insights into the dynamics of international relations and how shared practices among actors shape collective outcomes in the global arena. In her work 'Communities of Practice and What They Can Do for International Relations,' Bicchi examines how communities, which include individuals and institutions, interplay and engage in recurring practices. They create shared understanding, norms, and behaviours that influence international affairs, hence diplomacy, notably in the EU context. These communities build trust and foster collaborations that influence policy frameworks, notably in international settings, which are complex, diverse, and characterised by diverging interests and political tensions (Bicchi, 2022).

Through the lens of the practice theory, in *European Diplomacy in Practice: Interrogating Power, Agency and Change*, Bicchi explores EU diplomacy practices with a particular focus on the dynamics of European foreign policy cooperation (Bicchi & Bremberg, 2018). In the chapter 'Europe Under Occupation: The European Diplomatic Community of Practice in the Jerusalem Area', Bicchi investigates the European diplomatic community in the region, digging into how diplomats navigate the complex and tense geopolitical environment around the Israeli-Palestinian conflict. The 'community of practice' concept is analysed to understand how formal roles are balanced with the practicality of the relationships and dynamics on the ground. The EU community in Jerusalem functions not only as the formal representative community of agents of EU external policies (EEAS Officers/Agents) but also as a practice-driven, adaptive, and evolving entity able to navigate the local tensions and capable of negotiating power and agency in a volatile environment (Bicchi, 2016).

Bicchi's work resonates with my role as a diplomat in Tel Aviv, between 2019 and 2021, theoretically framing analysis and discussions around the formal role I had as attaché for R&I to design and execute EU policy

frameworks, and the work done across policy and project networks—formally and informally—trying to find the right balance to navigating the complex reality on the ground. Bicchi's theoretical approach contributes to the broader discourse on international cooperation, offering a social lens to understand how the interactions among states, organisations, and experts are enriched, guided, and influenced by the development and diffusion of informal but impactful networks.

Bicchi's insights are relevant for understanding EU external relations through a different perspective that is more centred on the individuals and the groups in which they participate. They become part of multilateral diplomacy and transnational cooperation across various fields, including research, innovation, and security. The relevance of communities of practice is essential in driving exchanges and supporting cohesion across opposing positions, resulting in more impactful and effective dialogues framing international affairs. Bicchi's work is helpful for this paper to bridge abstract theorisation with the on-the-ground changing dynamics of science diplomacy.

Whereas constructivism emerges as the theoretical blueprint for this investigation, additional conceptual tools were necessary to effectively frame science diplomacy as an evolving paradigm within the external politics and internal affairs of the EU. Science diplomacy's multifaceted nature requires additional theoretical refinement. Van Langenhove and James's (2017) positioning theory proves helpful in completing this conceptual framework.

POSITIONING THEORY

Positioning theory helps analyse and understand how actors position themselves within the context of science diplomacy. It becomes the filter to interpret science diplomacy as a vector used by individuals and institutions to mobilise resources for advancing collaboration activities

in the scientific domain, impacting public policies and society. This helps to qualify science diplomacy as a social construct (Van Langenhove & James, 2017).

Positioning theory in psychology focuses on the peculiar aspects of the interaction between individuals according to how they are positioned. This pertains to individuals' roles and specific storylines, which are directly linked with external situations and codified moral and behavioural constructs (Davies & Harre, 1990). Positioning theory helps to explain how individuals adopt determined conduct among many; they can choose from different positions already known to them and inform their interaction with others, setting new paths.

The social framework is based on rights, duties, codes, and moral aspects, both internal and external, as well as the recognition of roles and attribution of approved acts and boundaries. Hence, the positioning of the individuals in a context influences how they act, and, in turn, they influence the context in which they operate. This expands to society and impacts other individuals and networks. The individual's narrative is part of the positioning and how one interacts with others, where roles are relatively fixed and predefined. In these roles, individuals use expressions, languages, storytelling, and speeches to position themselves in a societal context based on their education (Harre & Moghaddam, 2003).

Following the positioning theory, science diplomacy emerges not only as a 'concept' used to identify and define a series of activities and cooperation frameworks linked with S&T, but also as a 'practice' which includes financing and resources mobilisation. Countries and individuals utilise it to achieve converging and diverging goals, depending on the positioning of the different players involved. As such, science diplomacy is one of the tools governments, individuals, and supranational entities, such as the EU, have at their disposal to influence, achieve specific objectives, and perform the advancement of science in society while

pursuing the betterment of people through science itself (Van Langenhove & James, 2017).

There is an interconnected mechanism of multilevel external affairs relationships, which impacts how governments interact. Science diplomacy can be seen as one of the ways science affects and benefits society. As a practice, science diplomacy is a social construct to brand activities having an instrumental capacity to start, develop, and accomplish relationships between 'positions, speech acts and storylines' (Van Langenhove & James, 2017).

This theory is relevant for analysing the role of the EC and the European External Action Service (EEAS) in science diplomacy through the practices and positioning of its officers, as it highlights how they construct their identity and influence the international arena. By incorporating the positioning theory in a multilayered framework for the study of science diplomacy, it is possible to better explore how the EU leverages science diplomacy to assert its global leadership, strengthen partnerships, and navigate geopolitical dynamics in the neighbourhood and beyond. This layered approach combines the dynamic analysis of practices with the strategic evaluation of positions, creating a comprehensive conceptual framework that captures the evolving nature of science diplomacy as both a practical and strategic endeavour in the EU's foreign policy.

Direct and indirect perception theories

The inclusion of the analysis of perceptions in the exploration of EU science diplomacy suggests that an additional theoretical step is needed. Perceptions are fundamental in defining, classifying, and understanding reality. Cognition experts generally classify perception into two broad groups: internalists, where sources exist inside the subject, and externalists, where sources are outside (Démuth, 2013). While internalists are convinced that any form of cognition is based on knowledge already inside the

individual, externalists believe that external sources and stimuli are the basis of any reading of reality (Bergmann, 2004). They both offer insights into how perception influences international engagement.

Direct perception and indirect perception theories elaborate on how individuals process information. Direct bottom-up perception theories, such as James Gibson's Ecological Theory of Perception, consider acquiring information to be a direct process driven by sensory input from the environment (Gibson, 1979). In contrast, indirect top-down theories, rooted in constructivism, suggest that perception relies on cognitive processes, such as memory, context, and prior experience, to interpret and make sense of information (Démuth, 2013). This indirect approach aligns with constructivist theories that underpin the analysis in this paper, offering a valuable framework for understanding how perceptions shape the actors and networks within selected case studies at the regional level.

Science diplomacy involves interpreting and operationalising complex realities, where perceptions informed by past experiences and cognitive processes shape strategic decisions. Perceptions are the final product of external and internal elements, including the actor's expectations, which are also influenced by motivation and emotions (Démuth, 2013). This is also explained through the Helmholtz likelihood principle, which states that we perceive our world in the most probable way due to our past experiences (Van Der Helm, 2000). These unconscious inferences shape how actors interpret their environment and influence their position and course of action in science diplomacy.

Empirical analysis reveals that the design and operationalisation of science diplomacy depends on the interplay between internal knowledge and external inputs, highlighting the importance of recognising and mitigating biases. The knowledge and expectations of the individual are emotional responses to external stimuli that impact the formulation process of perceptions. A better understanding of reality is

linked to the individual cognitive capacity and mobilisation; this allows to recognise indirect, wrong stimuli and preserve a more realistic perception (Lenay & Steiner, 2010). This explains the work done through science diplomacy, for example, to promote a better understanding of concepts through responsible data reporting, clear communication, and easy-to-access messages for broader consumption.

Perceptual organisation is further influenced by social and cultural contexts, which can impact the interpretation of key messages and actions within science diplomacy networks' beliefs (Rookes & Willson, 2000). Recognising these variations enables a better-tailored and effective approach to designing and implementing science diplomacy initiatives. This can impact the final perception process, and its understanding and recognition can offer interpretations for informed decisions about what to communicate through tailored campaigns focusing on key messages, how and where, to which audience, context, and point in time.

Ultimately, perception and reality construction processes in science diplomacy are dynamic and evolving over time. The complete package of our experiences, explanations, and understanding of reality is characterised and conditioned by the expressivity of the environment we are plunged into. As such, a conceptual construction informs what we see, believe in, and relate to. A process of reality construction takes place, and it becomes an evolution developed by the individual, alone, in the group, by society or part of it, with a direct link to beliefs and expectations (Stengers, 2008).

This paper argues the relevance of understanding perceptual biases, social and cultural contexts, and communication practices in shaping effective science diplomacy engagements. By grounding the practice of science diplomacy in constructivist perception theories, this paper contributes to understanding how actors and networks construct, interpret, and act within the framework of complex, dynamic realities at the intersection of international cooperation and scientific collaboration.

Impact assessment and qualitative frameworks for research and innovation

To complete this multilayered theoretical framework, a final effort is needed to guide the impact analysis of science cooperation programmes. The impact assessment of science collaboration programmes is scrutinised and explored to understand how programmes and projects become instruments of science diplomacy and further impact design and implementation at the policy and instruments level. Impact assessment is based on the link between the programme's impact assessment and qualitative frameworks for R&I. They must be seen in the context of broader scientific collaborations to assess the programme's usefulness throughout its cycle, from design to implementation and final evaluation, to inform the new design phase. The impact of programmes and projects is to be seen in the background of the benefits of fostering international cooperation and innovation nationally and regionally.

EU R&I Programmes assessed confirmed the development of project networks as part of the implementation process, which includes R&I activities, international cooperation to deploy research results, institutional capacity-building, training, mobility, and support for education. Programmes include primarily FP7 and Horizon 2020. Impact assessment relates to quantifying the benefits of these programmes as science diplomacy initiatives.

Impact assessment of programmes and public policy is a common phenomenon in Europe. The European experience can be referred to in order to understand how impact assessment frameworks can be created. In Europe, such frameworks typically encompass the social, environmental, and economic impacts of policies or programmes. Following von Schomberg, such frameworks help understand how technology assessment can be integrated into R&I programmes to address societal challenges and

promote ethical, sustainable, and socially desirable technological advancements (Von Schomberg, 2011).

Technology assessment frameworks can be used to assess the intended and unintended consequences of introducing new technology programmes or the outcomes that scientific cooperation can yield. In the EU science diplomacy context, impact can be measured by assessing technologies and processes deriving from scientific collaborations to understand the impact of science diplomacy on international cooperation and innovation at the project level. In this view, technology assessment frameworks, such as those used in the EU, are targeted to assess the impact of new knowledge creation, technology transfer, scale-up opportunities, and market penetration of new technology/products and services impacting international affairs and the local economy and society through innovation.

To assess the impact of science diplomacy on international collaboration and innovation in the EU Neighbourhood, with a focus on the Middle East, the Molas-Gallart conceptual framework of Third Stream Activities is selected (Molas-Gallart et al., 2002). Figure 1 illustrates its use. Activities on the left are assessed by their indicators as Associated Third Stream Activities on the right. Using the framework indicators, the impact assessment of programmes involving technology, research, and innovation can be assessed. *(Fig.1)*

Third Stream Activities focus on interactions and partnerships between academic institutions and external stakeholders—such as industry, government, and civil society—emphasising the dual goals of knowledge creation and societal impact. This approach can be adapted to assess how research programmes in the EU Neighbourhood, facilitated by EU science diplomacy, generate meaningful outputs such as project networks and technology products.

Table 1 illustrates how the framework is applied and the observations that emerge from the findings across the analysis of about 300 projects, their networks, and outputs

Fig. 1: Third-Stream Activities
(©Molas-Gallart, Salter, Patel, Scott, & Duran, 2002).

supported by EU funding programmes, notably FP7 and Horizon 2020, in the Middle East. Integrating the Third Stream Activities model into the analysis of science diplomacy provides a structured method for evaluating how R&I programmes in the EU Neighbourhood foster international scientific collaboration and innovation. *[See table 1 p. 64]*

Third Stream Activities highlights the interconnectedness of actors, networks, and outputs, offering actionable insights into the role of science diplomacy in achieving mutual benefits and addressing regional and global challenges. This addition to the framework for studying science diplomacy enables conducting project analyses to ascertain the impact of Science and Technology (S&T) cooperation on relationships with EU neighbouring countries.

The study of a social phenomenon can be done concerning the boundaries of one social system, one case, or several social systems, which are many cases (Schwandt

Table 1: Third Stream Activities (TSA) to assess science diplomacy (1)

Area of analysis	Third Stream Activities (TSA)	Observations
Multi-Stakeholder Engagement	TSA highlights the importance of partnerships and networks that extend beyond traditional academic boundaries.	In the Middle East, science diplomacy often involves engaging with diverse stakeholders, including research institutions, governmental bodies, private sector actors, and NGOs.
	TSA evaluates how R&I programmes activate and sustain multi-stakeholder networks that align with science diplomacy objectives.	Science diplomacy fosters mutual understanding, addresses shared challenges and promotes sustainable development.
Knowledge Exchange Mechanisms	TSA emphasises knowledge exchange as a driver of collaboration.	R&I programmes facilitate knowledge flows between EU actors and their Middle Eastern counterparts, including the co-creation of research agendas, capacity-building efforts, and joint problem-solving initiatives.
	TSA investigates the effectiveness of workshops, mobility programs, and collaborative research projects in advancing shared S&T goals.	Science diplomacy leverages mechanisms like workshops, mobility programs, and collaborative research projects to build trust, foster sustainable networks, and align international efforts toward shared S&T advancements.
Impact on Project Networks	TSA will examine how networks contribute to long-term collaboration, knowledge transfer, and institutional capacity-building.	One of the byproducts of R&I programmes in the Middle East is the formation of robust project networks.
	TSA assesses the density and sustainability of networks by analysing the frequency of interactions, the diversity of participants, and the outcomes achieved (e.g., publications, patents, or policy recommendations).	Science diplomacy fosters strong networks promoting diversity and tangible outcomes, reflecting its capacity to drive sustained international collaboration and innovation.
Assessment of Technology Products	TSA evaluates how products address regional challenges in areas like renewable energy, water scarcity, or healthcare.	The development of technology products is a tangible output of many R&I initiatives (including science diplomacy).
	TSA analyses the pathways through which technology products are translated from research outputs to market-ready solutions.	To consider the role of science diplomacy in facilitating cross-border technology transfer and scaling innovations.
Monitoring Societal and Economic Benefits	TSA emphasises societal impact, making it essential to assess how R&I programmes supported by science diplomacy contribute to societal and economic benefits in the Middle East.	Science diplomacy underscores the societal impact of R&I programmes, focusing on their contributions to economic development and addressing regional challenges in the Middle East.
	TSA examines indicators such as improved access to technology, enhanced scientific capacity, and strengthened policy frameworks that enable sustainable innovation.	Science diplomacy highlights the role of improved technology access, scientific capacity building, and robust policy frameworks in fostering sustainable innovation.

and Gates 2021). I would argue for the use of many cases involving different social systems—projects and networks for a more comprehensive and solid analysis. It' critical to apply the analysis and discussion of the phenomenon through a specific period, for example, the analysis of science diplomacy policy frameworks since the signature of cooperation agreements in S&T between two entities, until activities are implemented, and then monitored across the years. An interpretative approach is suggested to understand the phenomenon through lived experiences, both individual and within networks. In addition, a realist approach should be applied to each case to identify explanations that can be generalised beyond the specific context (Schwandt & Gates, 2021).

Framework Application	
Definition of clear metrics	Qualitative and quantitative indicators are identified to measure the performance of project networks, knowledge exchange activities, and technology products.
Use of case studies	R&I initiatives (e.g., SESAME, PRIMA, Horizon Europe projects, S&T agreements, EC Joint Communications) are analysed to identify best practices and lessons learned.
Engagement with stakeholders	Interviews and surveys with participants are conducted to gather insights on the perceived benefits and challenges of scientific collaborations.
Longitudinal analysis	The long-term impact of R&I programmes, such as the evolution of networks and market adoption of technology products, prompts future investigations.

Table 2: Third Stream Activities (TSA) to assess science diplomacy (2)

Table 2 outlines how the Third Stream Activities framework is applied to the analysis to drive empirical observations of social phenomena. To evaluate the performance of science diplomacy, a range of metrics is identified, focusing on three areas: project networks, knowledge exchange activities, and technology production. These metrics are designed to assess the effectiveness and impact

	Quantitative metrics	Qualitative metrics
Project Networks	Density: number of connections and collaborations between project participants (e.g., researchers, institutions, and countries).	Sustainability: partnerships evolve and continue after project completion (interviews or surveys).
	Diversity: stakeholders involved, such as academia, industry, government, and civil society actors.	Perceived Value: feedback on the perceived benefits of network participation for individual and institutional goals (interviews or surveys).
	Frequency: meetings, joint publications, and collaborative events generated by the network.	
	Geography: countries represented in the network and their regions.	
Knowledge Exchange Activities	Knowledge Outputs: number of joint publications, conference presentations, patents, and reports produced.	Relevance: knowledge shared aligns with participants' needs and the goals of science diplomacy initiatives.
	Capacity-Building: number of workshops, training sessions, and mobility programs conducted.	Satisfaction: surveys to evaluate participants' satisfaction with the content and delivery of knowledge exchange activities.
	Participation: attendance and engagement rates at knowledge exchange events.	Innovation: new ideas or methods emerging from these activities are being implemented in practice.
Technology Products	Technologies: number of prototypes, patents, or products resulting from R&I programmes.	Relevance: technology addresses issues like water scarcity, renewable energy, and healthcare access.
	Adoption rates: uptake of technology products by end-users or industries in the Middle East.	Policy impact: technology has influenced local or regional science, innovation, or economic development policies.
	Market Penetration: geographical and sectoral spread of technologies introduced in the region.	Sustainability and Scalability: the technologies' sustainability and potential for scaling across different markets or regions.
	Investments: follow-up investments in scaling or commercialising the developed technologies.	

Table 3: Quantitative and qualitative metrics for performance evaluation of project networks, knowledge exchange, and technology products

of collaboration programmes and selected projects within the country case studies of this investigation. Combining qualitative and quantitative indicators ensures a robust, multi-dimensional analysis, capturing science diplomacy's complex dynamics and outcomes.

Table 3 illustrates the metrics identified for empirical analysis. Metrics are applied to collaboration programmes and selected projects.

The identified metrics enable an in-depth examination of how international collaboration, capacity building, and innovation are operationalised and sustained through science diplomacy. They allow for measuring tangible outputs, such as the number of publications, patents, or technologies developed, and intangible outcomes, such as network sustainability and knowledge sharing. These metrics are applied to assess overarching collaboration programmes and analyse individual projects within the selected case studies, providing a comprehensive understanding of their contributions to the objectives of science diplomacy.

These metrics provide a structured approach to evaluate how science diplomacy fosters international scientific cooperation, addresses regional challenges, and promotes sustainable innovation in the Middle East. The dual-layered analysis, programme-level and project-level, ensures a comprehensive analysis of the effectiveness and impact of these initiatives, paving the way for actionable insights and policy recommendations.

A series of quantitative metrics is selected to investigate policy frameworks in the context of science diplomacy and, notably, their role in fostering international scientific cooperation and innovation. Table 4 illustrates the metrics utilised to investigate policy frameworks and the questions used for analysis. *[See Table 4 p.68]*

By applying these metrics, the investigation of science diplomacy can effectively assess how policy frameworks influence and are influenced by science diplomacy, shape

Qualitative metrics		Quantitative metrics	
Policy Alignment and Coherence	How well does the policy framework align with the broader goals of science diplomacy and international cooperation?	Number of Agreements and Initiatives	# bilateral or multilateral agreements resulting from the policy framework # initiatives launched under the policy
Stakeholder Engagement	How inclusive is the policy-making process, including the involvement of governments, academia, the private sector, and civil society?	Funding Allocations	€/$ financial resources allocated to implementing the policy framework and its initiatives
Flexibility and Adaptability	How adaptable is the framework to changing geopolitical, scientific, and technological landscapes?	Participation Metrics	# countries, institutions, or individuals involved in programs stemming from the policy framework
Perceived Relevance and Effectiveness	How do interviews and surveys capture stakeholders' perceptions of the policy's relevance to addressing regional challenges and fostering innovation?	Output Metrics	# joint publications, patents, or new technologies linked to the policy # improved infrastructure or expanded access to technology
Influence on Collaboration	How does collaboration lead to improving scientific capacity? How to establish the link between patents and innovation with regional growth? How does collaboration impact policy dialogues?	Impact Indicators	% increases in scientific capacity, economic growth linked to innovation, or advancements in regional cooperation # policy recommendations implemented or policy changes influenced by the framework

Table 4: Quantitative and qualitative metrics for performance evaluation of policy frameworks

international scientific partnerships, and contribute to innovation in the Middle East.

Process-tracing

Following the constructivist approach, process-tracing is suggested as the most appropriate empirical investigation methodology to identify causal mechanisms for the theorisation of EU science diplomacy's impact in fostering international scientific cooperation and innovation. Process-tracing allows the analysis of agency and individual as well as communities of practice behaviours, moving the research compass to the investigation of science diplomatic actions and activities as social constructions.

Process-tracing belongs to a broader group of qualitative analysis methodologies and techniques. It establishes a possible cause-effect relationship due to a specific change or series of changes. Within-case empirical analysis is at the foundation of process-tracing to explain the role of causality in a particular process, informing a concrete change. It can be used in case study analysis to highlight the causes-impact-links-changes dynamic for possible generalisations in similar contexts. It is used as a research methodology for theoretical frameworks underpinning the explanation of changes in historical events to capture old narratives in abstract theories in social sciences (Falleti, 2006).

Process-tracing is embedded in methodological individualism practices to unveil micro-foundations of individual behaviours, setting the link between cause and effect (Falleti, 2006). In a cause-effect relationship, one event causes another. One can assume the cause must occur before the effect is observed. This allows generalisation. When a cause occurs, one should expect the effect to occur. If this is not the case, another factor should be included in the relationships to explain the process and start over. Causal mechanisms are indispensable to understanding causation in new and evolving concepts such as science diplomacy. Causal mechanisms could lead to different outcomes, but the links with a specific context create a unique relationship, generating the portability of the concept (Falleti & Lynch, 2009).

A series of facts linked to framed contexts across the case studies was targeted to attempt an explanation that describes the observations and identifies the causes that led to specific outcomes. This is useful for studying science diplomacy, as it moves from the specific facts of case studies to generalisations. Process-tracing is used to assess policy frameworks, R&I FPs, projects, networks, and collaborations across selected case studies to understand if science diplomacy activities are linked to or originate from them. This technique enables understanding of performance

while developing a baseline for learning by doing and assessing what is useful or not in relation to specific causation in advancing the study of science diplomacy.

International and civil society organisations have begun using process-tracing to assess their policy-influencing capacity, demonstrating that a specific change is linked to a particular activity/programme they designed and implemented. Process-tracing is a single-case method, and it is thus necessary to apply it to multiple cases to identify evidence-supporting interpretations leading to new ideas and understanding of science diplomacy practices and their impact on scientific cooperation and innovation in the European neighbourhood.

Formal tests are illustrated in Table 5, an adaptation from Jeffrey Checkel and Andrew Bennett (2014) and David Collier (2011). The tests performed are explained as follows:

A straw in the wind test: If positive, it supports the hypothesis, which is not confirmed; if negative, the hypothesis is irrelevant but not ruled out. Passing this test is neither necessary nor sufficient for supporting or rejecting the hypothesis. I analysed patterns of interaction within project networks, such as participation in EU-funded programmes (FP7 and Horizon 2020), to identify signs of effective science diplomacy. For example, specific R&I cooperation (networks and outcomes) enhances international relations between MENA countries in solar energy production and desalination, particularly in a challenging geopolitical context. However, there is no complete evidence of causality and within-case impact.

A hoop test: If passing, it confirms the hypothesis and can be used to eliminate other hypotheses when failing. In the case studies, I examined whether the establishment of policy frameworks and networks was a prerequisite for advancing science diplomacy in specific areas. For example, activities stemming from science diplomacy frameworks, such as the Abraham Accords, support cooperation in key regional areas across

NECESSARY TO ESTABLISH CAUSATION	SUFFICIENT TO ESTABLISH CAUSATION: NO		SUFFICIENT TO ESTABLISH CAUSATION: YES	
NO	STRAW IN THE WIND TEST		SMOKING GUN TEST	
	Passing	Hypothesis is relevant but not confirmed	**Passing**	Confirms hypothesis
	Failing	Hypothesis is not relevant but not eliminated	**Failing**	Does not eliminate the hypothesis
	Implication for rival hypotheses	None	**Implication for rival hypotheses**	None
YES	HOOP TEST		DOUBLY DECISIVE TEST	
	Passing	Hypothesis is relevant but not confirmed	**Passing**	Confirms hypothesis
	Failing	Eliminates it	**Failing**	Falls short in establishing necessity and/or sufficiency
	Implication for rival hypotheses	None	**Implication for rival hypotheses**	Eliminates all other hypotheses

Table 5: Process-tracing (©INTRAC 2017) – adapted

countries that are not necessarily keen on collaboration. Collaborations in PRIMA involving Israel, Jordan, Lebanon, and the Palestinian Authority enhance regional cooperation to address climate change. The link does not necessarily confirm the hypothesis that science diplomacy is in place, but the absence of it would rule it out, undermining the causality of the influence of science diplomacy activities.

The smoking gun test: If passed, it confirms the hypothesis and identifies sufficient evidence of causality; if it fails, it does not eliminate it. I evaluated whether high-impact collaborative initiatives, such as SESAME in Jordan, green hydrogen investments in Saudi Arabia and the UAE, or COVID-related GCC initiatives, served as examples of science diplomacy fostering international scientific cooperation and innovation in the region. For example, Saudi Arabia praises international cooperation with the UK and Oxford University, particularly for the development of the MERS-CoV vaccine and COVID-19 vaccines. This partnership, involving the King Abdullah International Medical Research Centre (KAIMRC) and the University of Oxford's Jenner Institute, led to a Phase I clinical trial in Saudi Arabia. Saudi Arabia did not directly develop a COVID-19 vaccine with the UK, but this science diplomacy collaboration laid the groundwork for the Oxford-AstraZeneca COVID-19 vaccine. The MERS-CoV partnership underscores Saudi Arabia's significant contributions to global vaccine research and its readiness to address the pandemic. This does not mean that other international cooperation activities could have a similar impact. However, this does not mean either that the activity mentioned didn't influence international scientific cooperation and innovation in the region.

Doubly decisive test: This confirms one hypothesis and eliminates the others. I examined whether the presence of policy frameworks, coupled with the tangible outcomes of R&I programmes, demonstrated the impact of science diplomacy

in fostering scientific cooperation and innovation in the region. The analysis of PRIMA, SESAME, FP7 and Horizon 2020 projects, networks, and outcomes confirms the EU science diplomacy nature of these efforts. For example, in a public speech, European Commission President Ursula von der Leyen affirms that a particular activity is science diplomacy, which has a considerable impact on international cooperation and innovation. The COVID-19 Vaccines Global Access (COVAX) initiative, which aims to fight the COVID-19 pandemic through accessible vaccines for all countries, has directly impacted international cooperation between countries and innovation worldwide. It was true, confirmed, and acknowledged; other initiatives/activities are ruled out. This is, however, a rare situation.

The tests help gather evidence to support comparative analysis, develop new knowledge, validate the impact of science diplomacy, and test new theories. The intent is to find the evidence behind a specific event that resonates with science diplomacy over time and link that to causal inference. However, one must be cautious when applying this qualitative tool, especially when deciding whether to use the causal-inference test. The analysis may have missing variables, and the relationships between phenomena could ultimately be more complicated to identify and explain than in quantitative research. Following Collier's reasoning, some evidence can have more probabilistic value than others, thus having a more robust probing capacity (Collier, 2011).

Process tracing helps navigate complex causal relationships, offering a deeper understanding of how science diplomacy operates in different geopolitical and institutional contexts. This approach aims to contribute to validation. Five steps are identified for empirical qualitative analysis. With the caveat that they do not intend to trace a process univocally and independently but rather represent a contribution to development outcomes, the steps are: (1) Identify

the change; (2) Establish the evidence for the change; (3) Document the process leading to the change; (4) Establish alternative causal explanations; and (5) Assess the evidence and validation of the change. Each step connects to elements of science diplomacy, reinforcing its role as both a tool and a practice.

STEP 1: IDENTIFYING THE CHANGES. Identifying changes in international scientific cooperation through the lens of science diplomacy is linked to how science diplomacy facilitates and drives shifts in diplomatic interactions. The evaluation of frameworks for R&I highlights their nature as catalysts for these changes. By operating at the intersection of science and international affairs, through these programmes, science diplomacy impacts collaboration on R&I and how innovation diffuses and is adopted in the target countries. These changes reflect the influence of policy decisions through policy frameworks and the broader socio-economic dynamics of the region linked to innovation. This step identifies science diplomacy's role in addressing challenges and creating benefits in the MENA region.

STEP 2: ESTABLISHING EVIDENCE FOR CHANGES. The second step involves establishing evidence to support the connection between observed changes and underlying causes. Science diplomacy often involves intangible concepts—such as mutual understanding and trust-building—that claim tangible impacts, such as improved internal scientific cooperation, smoother diplomatic dialogues, or diffusion of innovation. This makes it essential to integrate traditional data collection methods, such as interviews, case studies, and surveys, with process-tracing techniques. By combining these approaches, the investigation traces causal relationships between science diplomacy activities and their outcomes, ensuring a link between observed phenomena,

such as increased interaction, number of project networks, institutional capacity building, education and training, researchers' mobility, and research outputs, with diplomatic, scientific, and policy actions underpinning them. Considerations claimed through the analysis of programmes and projects supported by science diplomacy, or supporting it, offer the ground for further investigation.

STEP 3: DOCUMENTING THE PROCESS LEADING TO CHANGE. Documenting the processes that lead to change involves creating a narrative that ties science diplomacy activities to their output and impact. The absence of an established theory of change linking science diplomacy to informing international scientific cooperation and innovation diffusion necessitates the development of an alternative theoretical reflection. This narrative captures the sequence of planned and implemented activities, contextual events, and their collective effects on regional international cooperation. The focus is on identifying the nature of the changes and their causes, allowing for the empirical assessment of how science diplomacy affects collaborations and innovation. This step illustrates the value of science diplomacy in addressing global challenges, demonstrating its contribution to broader development goals.

STEP 4: ESTABLISHING ALTERNATIVE EXPLANATIONS. Alternative causal explanations are considered, drawing from stakeholder discussions, theoretical frameworks, or a combination of the two. Science diplomacy operates within complex systems involving multiple actors, networks, and events, making it essential to explore diverse phenomena that could explain the changes. While it is rare to rule out all alternative explanations in social studies, this step provides a structured approach to understanding the interplay of factors that contribute to

changes. The sequence of events and external triggers associated with the impact of science diplomacy enhances the robustness of the analysis. This step considers different elements explaining the change, such as already established links between case studies with the EU, led by trade agreements for instance, existing cooperation mechanisms, and preference biases behind innovation scale-up and technological investments.

STEP 5: ASSESSING EVIDENCE AND VALIDATING HYPOTHESES. The final step involves assessment of the evidence to strengthen or weaken the case for each hypothesis developed. Science diplomacy requires evaluating different qualitative and quantitative evidence through activities such as policy frameworks, R&I programmes, diplomatic engagements, and project networks. By validating hypotheses with empirical evidence, this step ensures a thorough understanding of how science diplomacy activities contribute to international scientific cooperation and innovation. It also helps identify the mechanisms through which science diplomacy achieves impact, providing insights for policy-making and programme design.

These steps collectively clarify the mechanisms through which science diplomacy is designed, implemented, and evaluated, in the context of its three dimensions across case studies. By linking process-tracing methodological steps to the goals and activities of science diplomacy, this paper demonstrates its relevance as a dynamic and impactful practice in fostering international scientific cooperation and innovation in the vicinity of Europe.

Conclusions

This paper proposes a multilayered theoretical construct to investigate science diplomacy as lived practice

rather than a static concept. Grounded in constructivism and enriched by practice and positioning theories, the framework treats science diplomacy as a socially constructed, iterative system of interplay among institutions, individuals, and networks. It is complemented by perception theories to examine how actors interpret complex environments, by the Third Stream Activities model to assess programme and project impacts on innovation, and by process-tracing to identify causal mechanisms to investigate the impact of science diplomacy on innovation. Together, these layers provide an integrated lens for analysing how EU science diplomacy operates and with what consequences in the European neighbourhood, particularly in the Middle East, where it was tested across selected countries.

The framework advances the concept of science-diplomacy evolution through practices, rooted in constructivist processes that link structure to agency. Practice theory situates these dynamics within communities of practice, while positioning theory explains how actors strategically situate themselves to mobilise influence and resources. This framework allows for the investigation of science diplomacy as a tool and the outcome of cooperation, continuously shaped by its practitioners.

Perception theories illustrate how actors interpret and act within the science diplomacy ecosystem. Direct and indirect perception processes—shaped by cognitive, social, and cultural factors—define how scientific collaboration is understood and enacted. Perceptions influence trust, legitimacy, and the market acceptance of innovation. They also affect how scientific partnerships evolve and how technological products are scaled and adopted. By integrating perception as an analytical dimension, the framework reveals that communication, transparency, and contextual understanding are central to science diplomacy's effectiveness in fostering cooperation, innovation, and societal impact.

Four concluding reflections emerge from this paper.

First, the framework demonstrates the analytical value of aligning positions, practices, and perceptions for the investigation of science diplomacy as a social construct. Direct and indirect perception theories explain why identical signals are read differently across contexts and why trust, prior experience, and narratives matter for cooperation.

Second, the use of Third Stream Activities metrics connects programme design to tangible and intangible outcomes for the impact assessment of science diplomacy on innovation at the regional level: density and diversity of project networks; knowledge exchange and capacity building; translation of research into technology products; and societal and economic benefits.

Third, process-tracing provides the methodological backbone to move from plausible stories to evidence-based claims. Using straw-in-the-wind, hoop, smoking-gun and doubly-decisive tests across multiple cases allows the identification of when science-diplomacy mechanisms are present, how they operate, and under which conditions they contribute to cooperation and innovation. The approach also considers rival explanations (pre-existing trade agreements, geopolitical shocks, path dependencies) and documents sequences linking activities to outcomes.

Fourth, the framework yields practical implications for EU external action:

1) Consider R&I programmes as strategic diplomatic instruments and design them with built-in assessment indicators to capture network quality, knowledge mobility, and technology diffusion;
2) Invest in communities of practice that bridge policy and project networks; these communities are the carriers of agency that sustain cooperation through turbulence by routinary behaviours of the actors involved;
3) Make perception management a design component—anticipate cognitive biases, tailor messages to social and

cultural contexts, and use trusted intermediaries to reduce uncertainty;
4) Institutionalise process-tracing reviews at mid-term and ex-post to inform priority-setting to harvest learning in volatile environments.

This integrated framework yields both theoretical and policy value. Conceptually, it advances a coherent, practice-centred, perception-aware dimension of science diplomacy to assess its adaptive nature. Practically, it provides tools to design and assess R&I programmes as science diplomatic instruments: embedding Third Stream Activities metrics from inception, institutionalising process-tracing reviews, and investing in communities of practice that bridge policy and project networks. By treating science diplomacy as a social construction and empirical process, this framework offers a theoretically grounded, empirically validated approach for understanding and investigating science diplomacy and its constant evolution.

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Babeș-Bolyai University's Identity-Driven Diplomacy and its Societal Impact

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ABSTRACT

This paper builds on the arguments that the state-centric paradigm of science diplomacy is insufficient. Building on the conceptual shift proposed by scholars like Van Langenhove & Burgelman (2021) and the operationalisation of "science diplomacy actorness" by Piaget & Răduț-Gaghi (2025), it uses the new dimension of Diplomacy in Science as a concept with tangible societal impact. Unlike the traditional view of using science as a tool for diplomatic ends, Diplomacy in Science posits that diplomatic practice is inherently cultivated within academic institutions, where intercultural competence is fostered through daily academic and social interactions. This analysis acknowledges a crucial paradox: academic institutions are simultaneously autonomous yet often aligned with state interests, a dynamic that shapes their diplomatic role. Babeș-Bolyai University (UBB) serves as a prime case study, as its inherent multilingual and multicultural identity acts as a powerful, both top-down and bottom-up, diplomatic tool. Through a comparative analysis that includes the University of Warsaw and Charles University, this paper contrasts UBB's identity-driven approach with more state-aligned models. It concludes by proposing a new, evidence-based research agenda for the EUTOPIA alliance, designed to leverage its collective diversity and institutionalise Diplomacy in Science to enhance its global influence and societal impact.

Introduction

The traditional discourse surrounding science diplomacy has been dominated by a state-centric perspective. The foundational framework of Science in Diplomacy, Science

for Diplomacy, and Diplomacy for Science (Royal Society & AAAS, 2010) has served as a critical guide for understanding how states leverage scientific assets to achieve foreign policy objectives. This model has been critiqued, nevertheless, for its oversimplification of the roles played by non-state actors, such as universities, risking their reduction to mere instruments of national agendas (Fähnrich, 2017; Ruffini, 2020). We hypothesise that a more nuanced understanding is required, one that recognises the innate diplomatic agency of academic institutions, where universities act as both independent entities and instruments of national policy.

Building on this new perspective, this paper formalises the critical fourth dimension: Diplomacy in Science, brought forward by the European Commission in 2025. This concept redefines universities as active arenas where diplomatic practice is cultivated through daily interactions, governance, and academic pursuits. This form of diplomacy is less about grand international agreements and more about fostering a culture of collaboration, mutual respect, and intercultural competence from the ground up. It is an organic, bottom-up process with profound societal implications. This analysis is based on an in-depth review of UBB's official documents, including its Charter and Strategic Plan, alongside a comparative review of publicly available institutional documents from the University of Warsaw and Charles University. This conceptual analysis precedes future qualitative research, including interviews and surveys, to fully capture the empirical reality of this practice. It is important to note that the study primarily relies on institutional documents and may reflect, to a certain extent, the perspective stressed in these primary sources.

This paper builds upon this foundation by examining Babeș-Bolyai University's (UBB) unique identity as a multilingual and multicultural institution. We will argue that UBB's internal structure, a product of its long and complex history, serves as a powerful engine for a form of Diplomacy

in Science with tangible societal impact. Unlike models where science diplomacy is a strategic and external policy, UBB's is an inherent and internal characteristic that shapes its contribution to EUTOPIA and the broader global academic landscape. The paper will use a comparative analysis with the University of Warsaw and Charles University to highlight how this identity-driven approach stands apart from more state-aligned models. Furthermore, we will propose a new set of research questions for the EUTOPIA alliance, designed to move beyond general recommendations and address the specific challenge of leveraging its collective multilingual and multicultural assets for greater diplomatic influence and societal benefit.

Babeș-Bolyai University as a Nexus of Diplomacy through Institutional Identity

This internal diplomatic practice has profound societal implications, reframing university activities as a form of informal diplomatic practice (Cino Pagliarello, n.d.). Students and faculty are not just learning a foreign language; they are engaging in a form of soft power negotiation every time they collaborate on a research project, participate in a seminar, or simply share a common space. This creates a generation of graduates who are not only multilingual but are also inherently equipped with the skills of intercultural communication and conflict resolution, foundational skills for any form of diplomacy. While direct empirical data on this is still anecdotal, the university's structure provides a fertile environment for this to occur. This is a form of informal, bottom-up diplomacy that permeates every layer of the institution, from the classroom to the research lab.

Beyond the formal academic framework, this daily practice of intercultural interaction contributes to a shared social experience that fosters a common mindset. This shared mindset can be understood through the lens of "social hope", a concept that emphasises the ability of

a community to build a common sense of purpose and a belief in the collective ability to overcome obstacles (Deans, 2009). At UBB, this is cultivated in the everyday moments of a student's life, whether in a multilingual classroom, a student organisation, or a simple exchange in a hallway. These micro-interactions build a foundation of trust and mutual respect that directly contributes to the core mission of Diplomacy in Science. It is this organic, bottom-up development of a common mindset that distinguishes UBB's model from more rigid, top-down approaches to diplomacy.

The institutionalisation of this identity is further codified in its official documents. The Strategic Plan 2024-2029 and the Q-Optimum Program (2024-2029) reinforce UBB's commitment to its multilingual and multicultural character as a core pillar of its internationalisation and academic excellence (Babeș-Bolyai University, 2024; David, 2024). The university's response to the war in Ukraine, where it activated its existing multicultural networks to assist Ukrainian students and refugees, served as a powerful testament to the tangible societal impact of this identity-driven approach (Babeș-Bolyai University, 2022). Furthermore, UBB actively hosts Foreign Cultural Centres within its campus, as the only Romanian university with such a broad cultural and academic scope (Piaget and Răduț-Gaghi, 2025), providing a physical space for cultural exchange and fostering an environment where a diversity of languages and perspectives can thrive (Centrul de Cooperări Internaționale, n.d.).

This institutional approach aligns with scholarly views that a university's multilingual environment serves as a key diplomatic asset (Nawaz, 2023; Salloum, Siry, and Espinet, 2020). UBB's long-standing partnerships with institutions in Hungary and Germany, established long before the formalisation of European university alliances, serve as informal diplomatic bridges that have helped to ease bilateral tensions and foster regional stability. These actions, while often implicit, demonstrate a tangible societal impact that is unique to UBB's identity-driven model.

From Identity to Impact through Diplomatic Engagement

Building on its internal identity, UBB's approach is to embed its expertise directly into its local and international ecosystems.

LOCAL IMPACT

In its local ecosystem, the university's strategic documents and actions show it acts as a "hub for knowledge transfer" through several initiatives (Babeș-Bolyai University, 2024). A key dimension of UBB's diplomatic actorness is its deliberate public outreach, which bridges the gap between academic expertise and societal needs. The university's commitment to this is most visibly manifested in its Open Science policy and the creation of its dedicated Citizen Science platform (UNESCO, n.d.). This initiative moves beyond traditional science communication by actively involving a multicultural public in the research process itself, with the intention of strengthening trust in science and reinforcing the university's role as a steward of the global commons of knowledge. UBB's engagement in the European Citizen Science Association further cements its strategic position in this space.

Finally, the university fosters economic partnerships by co-creating "innovation units" with major socio-economic players and taking a leading role in national strategies, such as those in quantum communications and sports, thereby directly contributing to the local economy and development.

UBB's collaboration with companies such as Siemens, MHP Consulting Romania, and NTT DATA Romania demonstrates how academic and corporate entities can co-create knowledge and address global challenges. This model, particularly evident in the decade-long partnership with MHP Consulting Romania and Porsche AG, has provided unique opportunities for students, attracted funding,

and led to the establishment of the first Computer Science degree program taught in German in the country. This is a form of economic and technological diplomacy, as it positions the university and the broader region as a hub for innovation and skilled labour, enhancing its global reputation. These collaborations are strategic public diplomacy tools, showcasing the university's capacity to translate academic excellence into real-world impact and economic development.

This partnership is a prime example of Diplomacy in Science through institutional identity with both local and international impact. By offering a German-language program, UBB serves as a direct bridge to a major European economic power. It meets a specific industry demand while simultaneously preserving a significant linguistic and cultural heritage within the region. The university is not simply providing a service; it is actively shaping the local economy and forging a long-term diplomatic relationship with key international companies. This is a more profound form of engagement than a simple sponsored research project.

INTERNATIONAL IMPACT

To the examples above, we can add the participation in major internationally funded projects like the World Bank-supported INSPIRE platform (Petruşel, 2025). New projects, such as the ENGAGE laboratory for fluid geochemistry and the NRRP-funded EVOLUTION project on dynamic membranes for carbon capture and water purification, align UBB's scientific agenda with critical global challenges (Petruşel, 2025). These partnerships and networks provide the infrastructure for UBB to exert influence both in the public educational sphere (Science for Diplomacy) and the high-level policy sphere (Diplomacy in Science).

UBB's impact also extends to specific international regions, particularly through targeted partnerships and

academic programs that address global issues. The university has a strategic and active presence in Africa, with partnerships in countries like Algeria and Benin, often under the Erasmus+ program, which facilitates student and staff exchanges (Centrul de Cooperări Internaționale, n.d.). Similarly, UBB's agreements with universities in countries such as China and South Korea serve as tangible models of cultural and academic diplomacy. These include specific exchange programs and distinct cultural centres, such as the Korean Cultural Centre, that serve as physical spaces for cultural exchange and promotion on campus and within the local community (Centrul de Cooperări Internaționale, n.d.)

Diplomacy in Science—A Comparative Analysis of Babeș-Bolyai University, Warsaw University, and Charles University

While UBB's approach is deeply tied to its multilingual and multicultural identity, other Central European universities illustrate different models of university-led science diplomacy. A surface-level comparison with the University of Warsaw and Charles University in Prague reveals both shared practice (e.g. participation in European alliances and support for students during regional crises) and distinct pathways to diplomatic actorness. This comparative analysis highlights that while all three universities contribute to Science Diplomacy, they do so in fundamentally different ways. The University of Warsaw exemplifies a state-aligned model of Science for Diplomacy, closely integrated with Polish national priorities, particularly in strengthening Poland's role in regional cooperation networks (Arnaldi & Tessarolo, 2020; University of Warsaw, 2023). Charles University, while also advancing national interests, positions itself more strongly through cultural diplomacy and European integration, notably via its leadership role in the 4EU+ Alliance (Charles University, n.d.; 2023). This stands in contrast to UBB, which illustrates the potential

of Diplomacy in Science, where the university's very structure, its multilingual identity, acts as a diplomatic tool in itself (Gâz, 2011), fostering intercultural competence and trust among its stakeholders.

Aspect of Science Diplomacy	Babeș-Bolyai University (UBB)	University of Warsaw (UW)	Charles University (CU)
Model of Diplomacy	**Identity-Driven**. Diplomacy emerges organically from its multilingual and multicultural structure.	**State-Aligned**. Diplomacy is closely integrated with national priorities, particularly in strengthening Poland's regional and European role.	**Cultural & European**. Diplomacy is tied to Czech academic heritage while advancing integration through EU alliances like 4EU+.
Primary Diplomatic Role	Acts as a regional bridge f ostering intercultural collaboration, social cohesion, and trust.	Functions as a national champion, supporting Poland's science diplomacy and contributing to humanitarian aid in the region.	Serves as a cultural and intellectual hub for the Czech Republic while reinforcing European collaboration and excellence.
Institutional Structure	Organized into Romanian, Hungarian, and German academic lines, mandated by its Charter (UBB, 2021).	Primarily a Polish-speaking institution, with international programs taught in foreign languages.	Primarily Czech-speaking, with a broad range of programs in foreign languages (CU, n.d.).
Response to Crises	Mobilized multilingual and multicultural networks to aid Ukrainian students and refugees (UBB, 2022).	Implemented a comprehensive response for Ukrainian students and scholars, aligned with Polish state policy (Science in Poland, 2022).	Developed frameworks for emergency and crisis support, reflecting an institutionalized response (CU, 2023).
Key Diplomatic Instruments	Multilingual environment, cultural centers, and informal academic partnerships bridging linguistic and cultural divides.	Strategic international partnerships, departments for diplomatic training, and a strong public diplomacy strategy linked to national interests (UW, 2023).	Participation in EU alliances (e.g., 4EU+), promotion of national heritage, and extensive foreign-language programs.

Table 1. A Comparative Analysis of Science Diplomacy Models at Babeș-Bolyai University and Other Central European Universities

While a comparison with the University of Ljubljana could have also been illuminating due to its shared membership in both EUTOPIA and The Guild, our choice to focus on Charles University and the University of Warsaw was tactical, as they provide more distinct and contrasting models of university diplomacy, i.e. one based on national soft power and the other on expert-driven, government-aligned engagement.

The EUTOPIA Framework and Platform for Multilingual Science Diplomacy

The EUTOPIA alliance, with its diverse membership, offers a unique platform to scale and institutionalise the UBB model of multilingual and multicultural diplomacy. The report on university science diplomacy actorness is a timely and critical analysis of this phenomenon, focusing on three key universities within the EUTOPIA-Francophone project: UBB, CY Cergy Paris Université, and the International University of Rabat (UIR) (Piaget & Răduț-Gaghi, 2025). The report defines university science diplomacy actorness as the ability of an institution to actively participate and exert influence on the international stage through its academic, research, and educational activities.

Piaget and Răduț-Gaghi (2025) identify three core domains of university science diplomacy, which are relevant for our analysis: Teaching and Student Mobility, Research and Innovation, and Institutional and Public Relations. Crucially, Piaget and Răduț-Gaghi (2025) emphasise the vital role of multilingualism as a foundational element (Khasinah, 2024; Márquez & Porras, 2020) of a university's diplomatic actorness. The challenge for EUTOPIA is to move beyond simply acknowledging its members' diversity to actively leveraging it as a collective diplomatic asset. This requires a shift from a transactional model of student and researcher mobility to a transformative one that embeds multilingualism and multiculturalism into the

very fabric of the alliance's operations. The alliance should actively explore new initiatives that directly promote this. For instance, creating joint research projects that require collaboration across three or more languages would not only produce innovative science but would also serve as powerful diplomatic exercises. A researcher working in a lab with colleagues from Slovenia, France, and Spain is, by necessity, learning to navigate different communication styles and cultural norms. This daily practice is an invaluable form of diplomacy. Similarly, EUTOPIA could launch a "Multilingual Publication Fund" to encourage faculty to publish their research in multiple languages, thereby increasing the accessibility and reach of their work and, in doing so, advancing a form of public science diplomacy.

Moreover, the alliance could develop an "EUTOPIA Language and Culture Passport" for students. This would be more than a simple record of language courses; it would track a student's engagement in inter-university and intercultural projects, their participation in cross-cultural workshops, and their proficiency in multiple languages. It would serve as a formal recognition of the diplomatic skills they acquire as part of their EUTOPIA experience. By making these skills explicit, the alliance validates the non-scientific competencies gained by its students, thereby institutionalising Diplomacy in Science at the individual level.

Advancing Evidence-Based Assessment

To move beyond the existing discourse on science diplomacy and to truly benefit the EUTOPIA alliance, future research must be designed to measure and amplify the societal impact of its multilingual and multicultural identity. This paper proposes a new research agenda that serves as a roadmap for actionable, evidence-based policy.

The collective diversity of the EUTOPIA alliance represents an untapped diplomatic resource. This agenda aims to institutionalise Diplomacy in Science by focusing

on the following key research questions, each with a proposed methodology for assessment:

1. Measuring Bottom-Up Diplomacy

Can we move beyond general surveys and develop a quantifiable index to measure the proficiency of EUTOPIA's students and faculty in navigating multilingual and multicultural environments? This research would focus on developing a framework based on validated metrics from project outcomes, peer evaluations, and behavioural case studies, moving away from subjective, self-reported data to more objective measures of intercultural competence.

2. Assessing Multilingual Output and Research Innovation

Does collaboration across a greater number of languages and cultures lead to more innovative or impactful research outcomes? This question requires a longitudinal study that tracks EUTOPIA's joint projects, analysing the relationship between linguistic diversity within a research team and the subsequent citation rates, patents, or societal impact of their work. While this kind of research is challenging due to the need for a long-term data collection strategy, potential insights are significant.

3. Mapping Alumni Diplomacy Trajectories

Can EUTOPIA serve as a neutral, non-governmental platform for "track-two" diplomacy? This research would explore case studies of alumni careers, using interviews and network analysis to map how their EUTOPIA experience equipped them to act as diplomatic agents in sensitive geopolitical contexts. While measuring direct causality is difficult, identifying and analysing these trends can provide powerful anecdotal evidence for the alliance's value proposition.

4. Evaluating the Societal Impact of Multilingual Education

Beyond the academic sphere, what is the measurable societal and political impact of a multilingual educational environment on regional stability and cross-border cooperation? This question would require an interdisciplinary analysis, combining data

from social sciences, political science, and linguistics to map the effects of a multilingual university on the broader region's diplomatic landscape. While quantifying this is a significant limitation, a qualitative analysis of policy and social trends could provide valuable insight.

Answering these questions would allow EUTOPIA to not only enhance its global influence but also contribute to a more interconnected and cooperative world.

Conclusion

The practice of science diplomacy is undergoing a profound transformation. A university's diplomatic "actorness" is not solely a function of its external partnerships or state-aligned initiatives. Rather, it is deeply rooted in its internal identity, particularly in its commitment to multilingualism and multiculturalism. Babeș-Bolyai University stands as a powerful case in point, where its historical character has created an organic and powerful form of Diplomacy in Science that has a tangible societal impact and fosters a common mindset and a sense of social hope.

Through its trilingual academic lines and its diverse student body, UBB prepares generations of scholars and professionals who are inherently equipped for the complexities of global collaboration. This approach stands in stark contrast to the more state-aligned models of the University of Warsaw and Charles University, highlighting the diversity of pathways to university-led diplomacy.

By adopting the recommendations and pursuing the research questions outlined in this paper, the EUTOPIA alliance can move from an implicit to an explicit diplomatic actor. By institutionalising Diplomacy in Science, the alliance can harness the collective power of its member universities to address global challenges, foster intercultural understanding, and build a more collaborative and rational global community. We restate that in an

era of increasing geopolitical complexity, the ability of universities to serve as arenas for diplomacy is not just a strategic advantage; it is a global necessity.

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University Science Diplomacy: Lessons from the EUTOPIA–AUF Report

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Introduction

The following article provides an overview of the recent report authored by EUTOPIA and funded by the Agence Universitaire de la Francophonie. It also expands on themes inspired by the discussions that took place during the report's launch event at the Romanian Embassy in Paris on 24 September 2025.

In recent years, the concept of science diplomacy has gained remarkable traction across policy, academic, and diplomatic circles. At its core, science diplomacy refers to the diverse ways in which scientific collaboration and knowledge exchange intersect with foreign policy and international relations. While traditionally viewed as a tool of states, the field has gradually broadened to include a wide array of actors: international organisations, civil society groups, private companies, and increasingly, universities.

Universities, as globally connected institutions of knowledge production, have emerged as crucial yet underexplored actors in science diplomacy. They bring together international students and researchers, form cross-border research partnerships, and act as knowledge brokers between science and society. Yet, until recently, their role has rarely been assessed in a systematic way. It is against this backdrop that EUTOPIA, with funding from the Agence Universitaire de la Francophonie (AUF), produced a report that sought to measure and conceptualise the science diplomacy actorness of universities.

The report, Assessing the Science Diplomacy Actorness of AUF Members of EUTOPIA, focuses on three case studies—CY Cergy Paris Université (CY) in France, Babeș-Bolyai University (UBB) in Romania, and, Global Partner, the Université Internationale de Rabat (UIR) in Morocco—and asks a deceptively simple question: what makes a university an effective force in science diplomacy?

This article presents the report's main insights, elaborates on the eight domains identified as constitutive of university science diplomacy actorness, and reflects on the strategic, operational, and enabling tools that institutions can deploy to strengthen their contributions. It then considers the possibility of universities adopting dedicated science diplomacy strategies, drawing lessons from emerging practices, including the example of the University of Trieste.

Understanding Science Diplomacy Actorness and the Eight Domains

The report develops the notion of science diplomacy actorness, defined as the capacity of an entity, such as a university or a network of universities, to actively engage in and shape the science diplomacy landscape through its institutional structure. To enhance actorness, universities need to turn the implicit into explicit by consciously leveraging resources, networks, and expertise in ways that position them as contributors to global challenges and interlocutors in international dialogue. This approach aligns with what Luk Van Langenhove and Jean-Claude Burgelman have called the 'fourth dimension' of science diplomacy—or diplomacy in science—which shifts attention from how science serves diplomacy to how diplomatic practices emerge within and through scientific enterprise itself (Van Langenhove & Burgelman, 2021). In this sense, scientists and researchers can be seen as diplomatic envoys of science, with their universities functioning as their ministries of foreign affairs.

Another important aspect to keep in mind when examining the science diplomacy actorness of universities is the definition of science. As elaborated in the report, the meaning of "science" varies across linguistic and cultural contexts. For the purpose of this article (and the report that it draws upon), we adopt the broader understanding rooted in the Latin *scientia*, meaning knowledge in all its forms. It is important to note this to preserve the more focused strands of science diplomacy, which examine the role of scientists in advancing international cooperation, while at the same time acknowledging that universities engage in diplomacy through a much wider spectrum of disciplines. In this broader sense, scientia diplomacy captures how the broad university ecosystems contribute to international relations.

To operationalise the idea, the report identifies eight domains that are inherent to universities and provide effective avenues to measure their science diplomacy actorness. Below is an overview of these domains, as well as a snapshot of some of the findings in the studied universities.

I. INTERNATIONAL COLLABORATIONS

Perhaps the most visible indicator of a university's global engagement is its participation in international collaborations. These can be illustrated by various forms, such as joint research projects, co-authored publications, or partnerships in large-scale initiatives such as Horizon Europe. Collaborations extend the reach of knowledge beyond national borders, allowing universities to contribute to shared scientific advancements that can address transnational challenges like climate change, pandemics, or digital governance. Collaborations are not simple outputs. Rather, they are relationships that position universities within global knowledge networks.

When exploring this domain in the three universities subject to the report, we found that CY exemplifies

this domain in its "Europe-Africa-Asia axis," which spans partnerships with Egypt, Morocco, Cameroon, South Africa, Vietnam, Japan, China, and Singapore. These relationships take the form of joint research endeavours, double degrees, and shared laboratories such as SYNERGYLAB in chemistry with Stellenbosch University. CY has concluded 474 European and 209 international cooperation agreements. At UBB, international collaborations are equally extensive. As a member of The Guild since 2021, UBB has positioned itself within a major European research network and participates in projects such as INSPIRE, co-financed by the World Bank, which advances medical research and supports hospitals with state-of-the-art MRI infrastructure. UIR has established 290 cooperation agreements covering education, mobility, and joint degrees. Notably, 159 of these involve francophone institutions, reflecting UIR's embeddedness in the global francophone academic space.

II. DIPLOMATIC PARTNERSHIPS

Universities increasingly partner with embassies, foreign ministries, and international organisations, embedding themselves in the traditional diplomatic constellation. There are many examples, from research chairs funded by embassies (such as the Science Diplomacy Chair at the University of Ottawa, funded by the French Ministry for Europe and Foreign Affairs) to university-hosted events that convene diplomats and researchers around pressing issues. These partnerships, which offer platforms for dialogue and collaboration, illustrate how universities straddle both the academic and diplomatic spheres.

The report found that CY collaborates closely with embassies, notably with the Romanian Embassy in Paris for the launch of the AUF report itself. The French Embassy in Cameroon supports scholarships and mobility for CY students, while the French Embassy in

Vietnam participated in ceremonies for its joint program with HUTECH University. The French Ambassador to Malaysia even described CY's collaboration with INTI International University as a "master stroke" of academic diplomacy. Meanwhile, UBB's partnerships with diplomatic missions are long-standing and highly visible. Its collaboration with the Institut Français on campus exemplifies strong French ties, while the establishment of 24 cultural centres (e.g. Japanese, Indian, Nordic, etc.) fosters enduring bilateral exchanges. The university also hosts one of Romania's largest Confucius Institutes, which serves as a key platform for cultural diplomacy with China.

III. INTERNATIONAL STUDENTS AND RESEARCHERS

The number of international students and researchers hosted by a university is a powerful metric of its global appeal. These individuals are both consumers of education and carriers of values and ideas. Their experiences abroad shape their perceptions of host countries and institutions, and upon returning home or moving onward, they form part of a global cohort with enduring ties. This makes international mobility a cornerstone of science diplomacy, as it cultivates intercultural exchange and mutual understanding.

With that domain in mind, the report found that CY hosts more than 4,000 students representing dozens of nationalities. Among them, 19% of master's students and half of doctoral candidates earned their previous degrees abroad. Through its Institute for Advanced Studies (CYAS), CY annually welcomes around 90–100 international scientists for research residencies, strengthening its role as a global knowledge hub. UBB attracts students from over 35 countries and currently enrols more than 1,300 international students, including those from Hungary, Bangladesh, Algeria, Morocco, Guinea, France, Germany, Cameroon, and Nigeria. The university fosters

researcher mobility through Fulbright visits, co-supervised PhDs with partners in Canada and France, and has over 1,950 Erasmus+ agreements that facilitate academic exchanges. UIR, meanwhile, has seen a sharp rise in its international student body. Most international students come from Gabon, Côte d'Ivoire, Burkina Faso, Chad, and the Republic of the Congo, reflecting UIR's strong integration within francophone Africa and its commitment to expanding international enrolment to 10 per cent of the student population.

IV. ALUMNI NETWORKS

Closely linked to mobility are alumni networks, which can be mobilised as a university's "informal diplomatic corps." Alumni who occupy influential positions, whether in government, international organisations, or industry, often draw on their alma mater in forming partnerships or advancing initiatives. Moreover, properly structured alumni networks amplify a university's influence far beyond its campus.

We found that CY does not yet have a centralised alumni structure, but constituent schools such as CY Tech maintain dynamic networks. The university also participates in the France Alumni network, which connects more than 370,000 international graduates of French institutions, thereby extending its global visibility. UBB actively nurtures its alumni through digital communities and social platforms. It maintains ties not only with recent graduates but also with long-standing networks of African alumni who studied in Romania during the communist period, particularly from Burundi. These enduring ties testify to UBB's deep historical connections. Among its most distinguished alumni is Romania's President (2014–2025), Klaus Iohannis, symbolising the potential of alumni as diplomatic bridges.

V. RESEARCH FUNDING

Attracting international research funding is another telling indicator of actorness. Funding reflects both capacity and credibility: it signals that universities are trusted partners in addressing questions that transcend borders. Participation in transnational projects often entails collaborative governance structures, co-authored research, and policy-oriented outputs. All of which embed universities more firmly in international science diplomacy ecosystems.

Some snapshots from the report: CY's success in securing competitive grants includes an ERC Starting Grant awarded to a CY physicist (one of just 397 such early-career researchers in Europe that year). The university also participates in Horizon 2020 projects such as MEET (on geothermal energy) and MOBICCON-PRO (on sustainable construction), collaborating with universities and companies across Europe. UBB demonstrates similar strength, notably as a partner in the €3 million Horizon Europe project TWIN4DEM, which employs digital-twin technologies to enhance democratic resilience. It also contributed to the Horizon 2020 project CONVERGE on sustainable biofuels and secured a €35 million European Investment Bank loan to expand research infrastructure, supporting its InfoBioNano4Health platform that integrates IT, biotechnology, and nanotechnology to address health and environmental challenges. UIR strategically channels its research funding into six priority sectors (Artificial Intelligence and Cybersecurity, Renewable Energy and Advanced Materials, Health Sciences, Architecture and Urbanism, Global Studies, and Management Studies), which underscores its policy-aligned research orientation.

VI. INFLUENCE ON FOREIGN AND SCIENTIFIC POLICY

Some universities go beyond research to directly inform policy. This can be materialised through, for example,

expert advisory roles, synthesis reports, or convening policy dialogues. In doing so, they can act as miniature counterparts to global bodies such as the IPCC or IPBES. Their influence may stem from the prestige of their faculty or the policy relevance of their research. Or, perhaps, the mobilisation of their international communities. In many ways, universities help governments and international organisations respond to global challenges through shaping debates and offering actionable insights.

CY interfaces with national and international policy networks. A former president went on to head France's High Council for the Evaluation of Research and Higher Education (Hcéres). The university also engages with UNESCO, notably by featuring its Equality & Inclusion Plan on UNESCO's Open Science Hub, linking local institutional practice to global policy frameworks. Over to Romania, UBB has a long record of policy influence. The OSCE High Commissioner on National Minorities first engaged with UBB in 2000 to support its multilingual education model. UBB's former rector, Daniel David (who was appointed Romania's Minister of Education in 2024), is a powerful illustration of the transition from academic leadership to policy-making. Moreover, UBB researchers co-authored a comparative study on EU digital political campaigning, contributing to EU-level debates on disinformation and electoral integrity.

VII. INTERDISCIPLINARY CURRICULA

Science diplomacy requires fluency in both scientific and political languages. Universities contribute to the training of future science diplomats through interdisciplinary curricula that bridge international relations and the sciences. Courses, modules, or entire programs dedicated to science diplomacy provide students with tools to navigate complex policy-science interfaces. By embedding this perspective in education, universities cultivate the next generation of

actors equipped for careers at the intersection of knowledge and diplomacy.

At CY, interdisciplinarity is fostered through programmes such as the Master in Political Ideas in a Digital Age (PIDA), which blends philosophy, politics, and technology studies. CY Advanced Studies further promotes cross-disciplinary learning through thematic lecture series and doctoral workshops that unite researchers from across the humanities and sciences. UBB offers several master's programmes that indirectly cultivate science-diplomacy competencies, including the Master in Cultural Diplomacy and International Relations and the Master in Science, Technology, and Innovation in the Public Space. The university has also expressed interest in developing a joint EUTOPIA program specifically dedicated to science diplomacy. UIR's Sciences Po Rabat program provides courses in Governance and International Institutions, International Security, and Public Policy—all of which nurture the analytical and intercultural skills foundational to science diplomacy. UIR has also signalled willingness to develop a joint program in science diplomacy within EUTOPIA, furthering its vision for North-South cooperation.

VIII. PUBLIC ENGAGEMENT

Finally, universities wield significant influence through public engagement. Communicating scientific research in accessible ways, organising public lectures, or engaging with the media all help break down barriers between academia and society. This outreach is especially important in combating anti-scientism and fostering trust. By turning the ivory tower into a public forum, universities help make science more democratic. This resonates with Peter Gluckman's argument that "diplomacy is ultimately about managing relationships and we must increasingly focus on the relationship that science as an institution has with its society" (Gluckman, 2025).

For example, CY plays an impactful role in France's annual Fête de la Science, opening laboratories to citizens and schools. It also co-organises events, such as the 2024 Festival of Engineering with University College London, that extend its outreach beyond borders. UBB, meanwhile, engages the public through, inter alia, its UBB4Society & Economy initiative, designed to translate research into social and economic innovation. The university has collaborated with the British Council on science-communication initiatives such as FameLab 2021, helping to cultivate public understanding of research.

From Analysis to Action: Strategic, Operational, and Enabling Instruments

The report moves beyond identifying domains to propose a suite of recommendations that translate analysis into action. These recommendations are organised into three concentric categories: strategic, operational, and enabling instruments. This structure was inspired by Van Langenhove's Tools for an EU Science Diplomacy (2017) and the European Commission's A European Framework for Science Diplomacy (2025). Together, they offer universities and alliances a roadmap for strengthening their science diplomacy actorness through coordinated and sustained action.

STRATEGIC INSTRUMENTS

At the strategic level, universities are encouraged to formalise science diplomacy within their internationalisation, research, and innovation agendas. Embedding science diplomacy as a distinct strategic dimension allows institutions to move from ad hoc engagement to proactive positioning in global affairs. A first step in this process involves mapping internal assets to reveal leverage points and allocate resources more effectively. Equally important is collective

positioning through networks. For university alliances such as EUTOPIA, coordinated strategies allow institutions to amplify their impact by aligning efforts within broader multilateral frameworks and presenting a unified front in international scientific cooperation.

OPERATIONAL INSTRUMENTS

Operational instruments bring strategy to life by establishing the mechanisms and practices through which science diplomacy is enacted. Appointing science diplomacy focal points, such as individual officers or dedicated units, helps ensure coherence and visibility by creating clear contact points for embassies, ministries, and international organisations. Regular monitoring and evaluation of international projects, alumni engagement, and co-supervised doctoral programs through a science diplomacy lens can make these activities measurable, comparable, and accountable. Universities are also encouraged to mobilise alumni as informal envoys, leveraging their global presence to build trust and open new pathways for collaboration. Hosting events, roundtables, and networking sessions that bring together diplomats, policymakers, and researchers further reinforces the university's profile as a bridge between science and international affairs.

ENABLING INSTRUMENTS

Finally, enabling instruments provides the supportive environment needed to sustain these efforts over time. Developing training programs on science diplomacy for students, researchers, and administrative staff helps build internal capacity and shared understanding across institutional levels. Participation in communities of practice, such as the EU Science Diplomacy Alliance, facilitates mutual learning and peer exchange, allowing universities to stay connected to evolving practices and policy debates.

Encouraging research on science diplomacy itself can enrich both theoretical insight and institutional reflexivity, ensuring that universities remain not only practitioners but also producers of knowledge in this emerging field. Lastly, establishing mechanisms to track diaspora scientists and international alumni creates valuable feedback loops, enabling institutions to learn from their global communities and strengthen their visibility as transnational actors.

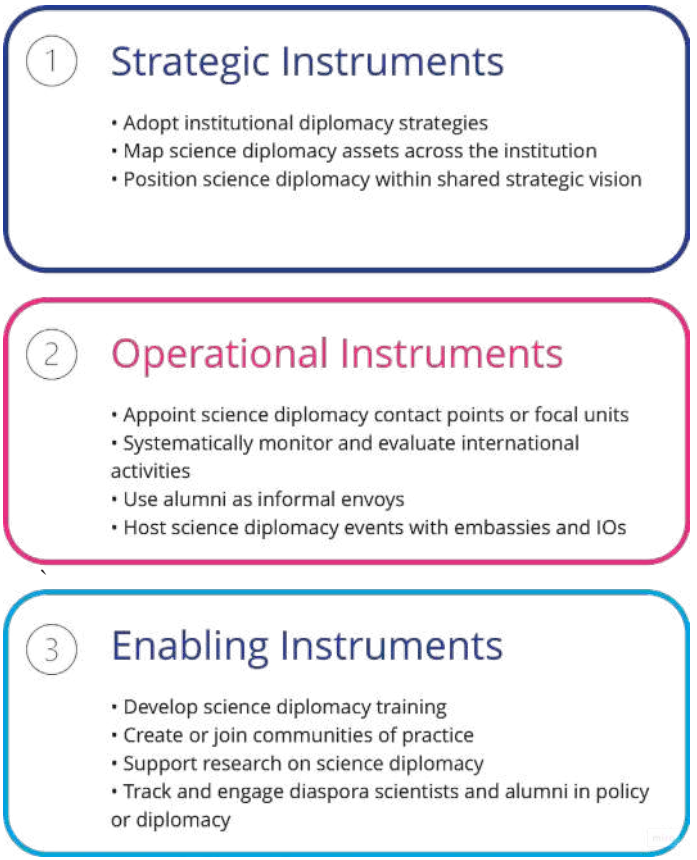

Figure 2: Instruments for University Science Diplomacy

Towards a Science Diplomacy Strategy for Universities

The natural question arises: should universities adopt dedicated science diplomacy strategies? The EUTOPIA–AUF report suggests that the answer is yes, though not without caveats.

Writing strategies are inherently challenging. As Rebecca Lissner, who helped draft the Biden administration's National Security Strategy (NSS), notes, the process is often beset by competing priorities, lobbying, and the risk of producing a "Christmas tree" of disparate ambitions (Kroenig, 2025). Mara Rudman, who coordinated the Obama administration's 2009 NSS, emphasises the importance of focusing on the "why, what, who, and how" to ensure strategies are both effective and executable (ibid).

While inherently different to a country developing an NSS, universities developing a science diplomacy strategy would arguably face similar obstacles, such as balancing faculty interests, managing stakeholder input, and maintaining coherence across diverse missions. However, adopting a structured approach anchored in these four guiding questions could help them navigate the complexity. The why should articulate the purpose and clarify how science diplomacy advances the university's mission and contributes to societal and global goals. The what should define the scope of activities, from international partnerships and alumni engagement to policy advisory work. The who identifies the internal and external actors involved (e.g. leadership, researchers, students, alumni, and diplomatic counterparts) ensuring clear ownership and accountability. Finally, the how addresses implementation, outlining mechanisms, resources, and evaluation processes needed to turn vision into action.

Of course, as the saying often attributed to Peter Drucker reminds us, "culture eats strategy for breakfast." This insight is particularly relevant for universities contemplating the adoption of science diplomacy strategies.

Without a strong institutional culture that values and understands science diplomacy, even the most carefully designed strategies risk remaining on paper. In this sense, enabling instruments are just as critical as the strategic and operational ones positioned higher on the pyramid. They nurture the mindset, skills, and relationships that allow strategy to take root and flourish. Arguably, building this culture of science diplomacy within universities is therefore not a secondary task but a precondition for making strategic and operational ambitions truly actionable.

Some universities have already begun moving in this direction. The University of Trieste, for example, has recently initiated a process to develop its own science diplomacy framework (EU Science Diplomacy Alliance, 2025). Recognising both its strategic location and its history as a hub of international scientific cooperation, Trieste has convened academics, diplomats, and international networks to outline future guidelines for engagement. Through workshops and technical roundtables, the university has started to translate diffuse practices into a more structured institutional approach. Although this process remains in the pipeline rather than formally adopted, it represents an encouraging step toward embedding science diplomacy as a strategic function within university governance.

Conclusion

The EUTOPIA–AUF report makes a clear contribution to the evolving field of science diplomacy by articulating the concept of university actorness and identifying eight domains through which it can be assessed. It should be noted that these eight domains are not exhaustive and that further study is encouraged to refine and expand them as our understanding of university science diplomacy continues to evolve. More importantly, it points the way forward with a practical toolbox of strategic, operational, and enabling

instruments. These tools also remain open to refinement and improvement as the field matures.

We hope that this line of inquiry continues, as universities are not passive participants in the global science-diplomacy nexus. They are active, resourceful actors whose collaborations, partnerships, alumni, influence, and curricula shape international relations in general and science diplomacy in particular in powerful ways. However, much of this still remains implicit. Recognising this role and considering the adoption of dedicated strategies is a step universities should consider in order to make their role more explicit and to strengthen their capacity to serve as global actors.

The journey will not be without challenges. Crafting strategies requires balancing diverse interests, avoiding overextension, and ensuring coherence. Not to mention futile without a robust culture upon which a strategy can emerge from. Yet, as the ongoing example of Trieste shows, it is possible to take action in this regard. Other universities should keep an eye out for what develops in this university near the Adriatic. After all, in the current age marred by climate change, pandemics, digital transformation, and geopolitical tensions, the ability of universities to act as science diplomacy actors is not a luxury. Rather, it is a necessity.

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Why Should Scientists Become Diplomats of Science?

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The following is based on a lectio magistralis *delivered at the PhD award ceremony at Ca' Foscari University of Venice, 28 May 2025*

In 1974, the American philosopher Thomas Nagel published an article entitled "What It Is Like to Be a Bat?" It remains famous today because it addresses many of the enduring problems in the philosophy of science. The title of that article inspired me to reflect upon what it means for a scientist to be a doctor.

Often, holding a PhD is seen as proof of having acquired certain skills and expertise that allow one to become an independent researcher. As many academic job descriptions state, a PhD in a given field is required for an academic career. Being, for instance, a doctor in chemistry or in psychology qualifies someone as an expert in a specific domain of knowledge. A psychologist is not expected to have expertise in chemistry, and vice versa.

However, there are instances where speaking across disciplines is invaluable. My main point is that, notwithstanding the obvious limits of disciplinary expertise, scientists can — and should — do more than remain specialists in narrow areas. This means being open to other fields and fostering interdisciplinarity. But it also means something more: every scientist, regardless of specialisation, should serve as an ambassador for science as a whole.

This idea arises from reflecting on the rights and duties given to scientists, and on how society views science.

Today, science faces criticism and distrust, and scientists have a moral duty to counter these trends by advocating for their rights and strengthening the influence of science in public policy. Of course, no one acts alone. We must also consider Europe's role in addressing these issues.

1. The Moral Orders of Science

Holding a PhD confers a certain status in society. That status shapes how science is perceived — and how scientists perceive themselves and the world. Being addressed as a doctor, and seeing oneself as one, creates a moral space of rights and duties (Van Langenhove, 2017). Doing what we believe to be the right thing is essential for all of us, scientists included.

DUTIES

Being a scientist involves not only the acquisition of skills and knowledge but also a set of moral obligations — what psychologists call a moral order. At any moment, multiple moral orders are at play, shaping what is appropriate and what is not.

Scientists have responsibilities toward students, colleagues, and stakeholders (universities, funding agencies, etc.), as well as toward the general public. These are obvious duties, but I would add one more that is crucial: the duty to be as interdisciplinary as possible. Scientists must engage with colleagues in other fields. At the end of the day, we are all more non-experts than experts.

Scientists must also engage in dialogue with society, since it is society that provides the freedom and resources necessary for research.

RIGHTS

In the moral order of the scientific community, there are also specific rights that a PhD confers:

* The right to judge peers regardless of status. This principle underpins the anonymous peer review process. No matter one's reputation or seniority, every submitted article is evaluated by colleagues whose names are unknown. Only they can judge whether a work is fit for publication. If others intervened, we would call it censorship.

* The right to apply for funding. Governments, private foundations, and companies all make money available for research. Having a PhD opens the door to submitting proposals. Of course, funding is limited, and states may cut budgets for financial or political reasons.

* The right to publish freely. Within the limits of peer judgment, scientists must have the freedom to publish their results. State authorities, or anyone else, should not interfere with what scientists want to say.

These are three fundamental rights of scientists—and it is troubling that in some countries they are increasingly under threat. It is extremely worrisome to see that even the world's greatest scientific power is now violating these rights.

2. Society's Evolving Attitude Toward Science

Science is one of humanity's greatest achievements. Though it has roots in many cultures and civilizations, it was during the European Renaissance that science became an engine of economic and social development.

Originally, science was a pastime for those who could afford it. That changed dramatically when scientific knowledge became tied to technological innovation. Science became a driver of national wealth and power, prompting states to invest in it as a tool of prosperity. It also became an element of international relations.

The entanglement between science and international affairs began when technological progress became central to warfare — for instance, with the invention of gunpowder. Ever since, science and technology have been crucial for military capability. Governments have thus developed strategies for military-oriented R&D, investing public money to secure technological advantage.

Scientific knowledge is often used to achieve private (commercial) or national (military) goals. There is nothing inherently wrong with that, though the participation of scientists in developing, for instance, nuclear or chemical weapons does raise ethical questions.

At the same time, science has also fostered peaceful collaboration among states, leading to innovations that serve humanity as a whole. In this sense, scientific knowledge can be seen as a global public good, essential to tackling shared challenges.

As a result, two competing normative images of science in international relations coexist today:

* Science as an instrument of state power, supporting technological sovereignty and economic competitiveness — an approach aligned with realist theories of international relations.

* Science as a driver of global cooperation, addressing common challenges and promoting human welfare.

Yet a third, worrying trend is also emerging: anti-science policies. Autocratic regimes increasingly control research, limit academic freedom, and deny evidence that contradicts their worldviews. Disturbingly, similar attitudes now appear in some Western societies.

Most alarming of all, the United States—long the champion of scientific progress—has introduced measures that restrict academic freedom. As *The Economist* reported:

> "With the stroke of a pen, officials are trying to impose new rules that tell scientists what areas of inquiry they may pursue and what is off limits – a shocking step backwards for a republic founded on the freethinking values of the Enlightenment."

3. Freedom and Science

We often hear that we live in a time of transition. New technologies are transforming society. Old alliances are under strain. Global power relations are shifting. Some even speak of a "new world order."

In such times, we must embrace change without abandoning our core values. More than ever, we need moral compasses. For me, that compass is humanism — the belief in people as free, reasoning beings.

Two historical models of freedom can help guide scientists in translating this belief into practice: Roosevelt's Four Freedoms and Europe's evolving Five Freedoms.

Roosevelt's Four Freedoms

Former U.S. President Franklin D. Roosevelt identified four freedoms essential for democracy: freedom from fear, freedom from want, freedom of speech, and freedom of belief. Applied to science, these imply that a research-friendly society should:

* Protect academic freedom and free speech.
* Ensure scientists never fear state interference.
* Provide sufficient funding for research.
* Accept scientific results, even when inconvenient.

Europe's Five Freedoms and the ERA

The founding fathers of the European Union envisioned a common market based on the free movement of persons,

goods, services, and capital. Later, a fifth freedom—the freedom of research—was introduced, reflecting Europe's shift toward an economy based on access, sharing, and knowledge exchange.

The European Research Area (ERA), launched in 2000, aims to enable cross-border cooperation among researchers, knowledge, and technology, and to remove legal and fiscal barriers to such collaboration. Though added to the EU Treaties in 2009 (Article 179 TFEU), it remains unfinished. Member States have shown only lukewarm commitment, and as LERU already notes: "the EU still cannot rely on a fully effective ERA capable of attracting, retaining, and nurturing its talent under optimal conditions."

There is hope, however. Commissioner Ekaterina Zaharieva has been tasked with preparing an ERA Act to address these remaining challenges — now in consultation through a call for evidence and public review in 2025.

Former Italian Prime Minister Enrico Letta has also proposed that the "freedom of research" be considered a fifth European freedom, reflecting the transition from an ownership-based to an access-based economy. We welcome this ambition, but such a framework must go beyond the Single Market and mobilize research toward global challenges, academic freedom, and Europe's position as a safe haven for scientists at risk.

We should therefore call on Commissioner Zaharieva to develop a global framework for a new European Renaissance, grounded in research and guided by science diplomacy. Diplomacy is needed to connect science to policymakers and citizens, to promote Europe's image as a safe and open space for knowledge, and to remind the world that competitiveness is not the only goal that matters.

The European University Initiative could play a vital role in this process.

4. Science as a Project for Europe

The rise of anti-science movements—including those in the U.S.—is not only an attack on science itself but also an attack on Europe and the values it represents. We must respond, because science is more crucial than ever to addressing global challenges such as climate change, nuclear proliferation, and geopolitical instability.

These problems demand a new Renaissance—one that reaffirms science as a positive project for humanity. This is not a naïve belief that science can solve all problems, but a recognition that progress depends on inquiry and openness.

Europe, one of the cradles of modern science, should reclaim the values of the Renaissance and strive to be the best environment for research in the world — promoting science for the global commons. A European strategy grounded in democratic governance, market integration, and creativity could make Europe a space where knowledge flourishes.

Science contributes to society in three fundamental ways:

i. It provides meaning and purpose to citizens.
ii. It offers evidence-based responses to global challenges.
iii. It fosters innovation through cooperation and open science.

Combining European and humanist perspectives on freedom allows us to construct a narrative of Europe as a haven for researchers — a place where they can think, create, and collaborate freely. Such a vision should operate on three levels:

* Strengthening intra-EU research collaboration.
* Using science as a soft power tool in relations with neighbours.
* Supporting global scientific cooperation, including protection for scholars at risk.

As the European Framework for Science Diplomacy report noted, there is hardly any geopolitical development that does not affect research and innovation. Science must therefore move to the centre of EU policymaking—not remain at the fringe.

5. Conclusions

Science today faces a paradox. On one hand, more research is needed to solve global challenges. On the other, independent science is increasingly under attack, and scientific protectionism is on the rise.

We should remember Alexis de Tocqueville's warning in *Democracy in America*, and recall Durkheim and Weber's plea for a *frei schwebende Intelligenz*—a free-floating intelligence. Europe has a historical mission to create the conditions for such free thinking.

To achieve this, every scientist must act daily as a diplomat of science, defending the values that make research possible.

We must call upon universities to unite their efforts through European University Alliances that attract students from within and beyond Europe—and I am pleased to note that this university is showing how to do so through its engagement in EUTOPIA.

As a first step, the coordinators of European universities should mobilise their institutions to contribute to Commissioner Zaharieva's ERA Act. As a second step, European universities should develop science diplomacy programmes in relevant areas.

We must also call upon academics to keep science for the public good at the centre of their attention. Mobilising science for warfare may sometimes be unavoidable, but academia must tread carefully. As Erasmus once said: "War tastes sweet to those who have never experienced it."

And so, dear fellow doctors, now that you have been introduced to the moral order of university research, you

are ready to become diplomats of science. What do such diplomats do? They talk. As the great philosopher of science Rom Harré once said:

> "The reconstruction of society can happen at any time, by anyone, in any conversation."

Thank you for your attention.

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