

# INSIGHT BRIEF

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## Laboratories and City Halls: The Science Diplomacy-Paradiplomacy Nexus

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### Highlights

- Cities and regions are becoming increasingly important in addressing global challenges. Both are taking proactive steps in areas such as renewable energy, industrial innovation, and environmental conservation, often surpassing their national counterparts.
- Science diplomacy and paradiplomacy are two forms of non-traditional diplomacy that can help to address global challenges. Science diplomacy harnesses scientific collaboration to facilitate global cooperation, while paradiplomacy involves the engagement of subnational governments in international affairs.
- The fusion of science diplomacy and paradiplomacy, known as science paradiplomacy, is a growing trend. Science paradiplomacy allows subnational governments to use scientific collaboration and knowledge to shape international policy and contribute to global governance.
- Science paradiplomacy is a powerful platform for addressing global challenges at both the global and local levels. Subnational actors, empowered by scientific collaboration and policy innovation, are uniquely positioned to drive the future of international relations.

### Introduction

The foreseeable forecast for the world is stormy, with challenges such as climate change, pandemics, and technological disruption transcending borders and posing an existential threat to all. These global challenges often have scientific and diplomatic solutions, yet the traditional nation-state framework struggles to provide timely responses, as evidenced by political paralysis, geopolitical rivalries, and growing fragmentation. As a result, subnational actors, such as cities and regions, have an increasingly vital role to play filling the void in addressing these global challenges. Cities generate more than 80% of global GDP<sup>1</sup>, are expected to be home to 68% of the global population by 2050<sup>2</sup>, and constitute the hubs of global connection. Meanwhile, subnational regions, from Catalonia and Flanders, over the German Länder, to Ontario and Victoria, have taken proactive steps in areas such as renewable energy, industrial innovation, and environmental conservation, sometimes surpassing their national counterparts in setting ambitious targets and developing international partnerships.<sup>3</sup> The influence of cities and regions is only set to grow as the storm of global challenges worsens. In addition, it was estimated that for approximately 65% of the targets to reach the SDGs, they will only be successfully implemented if the subnational policy-levels are involved.<sup>4</sup>

1 World Bank, 2023.

2 UN DESA, 2022.

3 Jones, 2014; Van Langenhove, 2017, p. 8.

4 Valencia et al., 2019; Okitasari et al., 2024.

There is thus an urgent need to invest more deeply in the nexus of science diplomacy and paradiplomacy, two forms of non-traditional diplomacy that harness scientific collaboration and subnational government engagement to facilitate global cooperation. Amalgamating these two fields works towards establishing critical local connections between science and policy, which are essential for addressing complex issues, while also playing a role in reshaping global science-policy frameworks by prioritizing subnational challenges and the scientific insights related to them.

In this Insight Brief, we will provide succinct overviews of two fields: science diplomacy and paradiplomacy. We will then introduce the fusion of these two, science paradiplomacy, and shine a light on examples that exemplify it, such as the C40, Global Covenant of Mayors for Climate & Energy (GCoM), the SciTech DiploHub in Barcelona, and subnational efforts to address COVID-19. Finally, we will conclude with some considerations that seek to turn the often implicit praxis of science paradiplomacy more explicit.

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### Science Diplomacy

Science and diplomacy have intersected since antiquity. From the Bronze Age to the Cold War, science has been a potent accessory to foreign relations, both in terms of the hard power derived from military applications and soft power cultivated through scientific advancements. The term science diplomacy, however, only crystalized in the 2000s. The British Royal Society and the American Association for the Advancement of Science (AAAS) unveiled a widely adopted tripartite conceptualization of the term in their 2010 report *New Frontiers in Science Diplomacy*:

- **Science in Diplomacy** – the inclusion of scientific knowledge in diplomatic processes, as can be seen in the IPCC research that supported negotiations under the UNFCCC.
- **Science for Diplomacy** – scientific collaboration as a means to foster diplomatic relations, such as Edward

Jenner’s vaccine diplomacy during the Napoleonic wars.<sup>5</sup>

- **Diplomacy for Science** – the process by which diplomatic actions pave the way for more scientific cooperation, illustrated by international agreements that established international research infrastructures like the European Organization for Nuclear Research (CERN).

This conceptualization can be interpreted either as essentially a typological effort, or it can be interpreted as an attempt to theorize the connection between the involved phenomena.

In this vein, these tenets arguably operate symbiotically, with diplomacy for science facilitating science for and in diplomacy, which encourages more diplomacy for science. While groundbreaking, this conceptual framework has faced criticism for being too optimistic about the role of science in facilitating friendly diplomatic relations, a reflection of the liberal world order that prevailed following the Cold War and the assumption that shared challenges would naturally encourage shared solutions. The Russian invasion

of Ukraine in 2022 and the growing Sino-American rivalry, however, have spearheaded a new weaponization of science, evidenced by scientific sanctions, research security, concerns over dual-use, and industrial espionage.<sup>6</sup> Consequently, the Royal Society and AAAS, alongside many scholars, are currently in the process of modernizing the

conceptual framework to reflect the current realities of the global landscape.<sup>7</sup> At the same time, science diplomacy is considered by some as an opportunity for keeping international conversations ongoing when complicated geopolitical developments are closing traditional diplomatic doors.<sup>8</sup>

Science diplomacy is thus a broad umbrella that can accommodate all facets of science, both social and applied, on multiple diplomatic tracks, for national security or global development, yet Fägersten’s definition manages to consolidate it succinctly: “the use of science for foreign policy purposes.”<sup>9</sup>

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<sup>5</sup> Iancu et al., 2021.

<sup>6</sup> Baykal & Benner, 2020.

<sup>7</sup> Montgomery & Wiggins, 2024.

<sup>8</sup> Van Langenhove, Shendrikova & Mays, 2024, p. 13.

<sup>9</sup> Fägersten, 2022, p. 5.

## Paradiplomacy

Paradiplomacy refers to the participation of subnational governments, such as regions or cities, in international affairs. Before the notion of the modern state, embodied by sovereignty, was born in ashes of the Thirty Years War, cities and towns played the leading role in diplomacy.<sup>10</sup> From the ancient Greek city states, to the urban centers of the Hanseatic League, to the Italian and Flemish cities of the Renaissance, what are now called subnational actors were once the primary catalysis for diplomatic engagement. The Nation State, however, has dominated the conduct of international relations since 1648, when the Peace of Westphalia replaced feudal principalities with sovereign states.<sup>11</sup>

The involvement of subnational entities in international relations is nothing new. As Tavares points out, the then-British province of Quebec opened representation offices in London, Paris, and Brussels in the early 20th century, while the Brazilian state of São Paulo formalized a diplomatic agreement on immigration with the Empire of Japan in 1907. Over the years, subnational diplomacy has continued to evolve, with subnational authorities playing a key role in shaping international relations, including global cities.<sup>12</sup> The International Union of Local Authorities emerged to promote cooperation among municipalities worldwide, while post-World War II town twinning and sister city initiatives fostered peace and cultural exchange between cities across national borders. More recently, the Four Motors for Europe, a network linking four highly industrialized and research-driven regions, that also signed an agreement with Canadian province of Ontario, exemplifies how regional partnerships can drive innovation and economic growth on an international scale.<sup>13</sup> Today, over 125 multilateral networks and forums unite subnational entities around the world to collaborate on a diverse array of issues.<sup>14</sup>

The term paradiplomacy is more recent, introduced by Duchacek in the 1980s to emphasize the ability of subnational entities to engage with foreign actors and shape global governance.<sup>15</sup> This has countered the longstanding notion

that diplomacy is only the responsibility of sovereign states. Paradiplomacy, thus, reflects a shift toward decentralization in international relations, where subnational governments are often better equipped to handle specific local-global challenges through international engagement. Through this lens, globalization and localization coexist in a dynamic interplay. At the same time, supra-national regions like the African Union (AU) or European Union (EU) have also become diplomatic actors, further underlining the multi-level nature of contemporary diplomacy.

As Hsu et al. highlight, paradiplomacy can occur through interaction between horizontal and vertical linkages—between subnational entities engaging directly with each other (horizontal) and integrating their efforts with the central government’s foreign policy agenda (vertical).<sup>16</sup> This conceptualization sees subnational actors as able to both advance their own interests and contribute to broader national or global goals. For example, Quebec and Catalonia are often cited as protodiplomacy cases, regions where subnational entities engage in foreign affairs partly to assert their autonomy or independence.<sup>17</sup> In contrast, places like the Belgian regions, U.S. states, and the German Länder

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operate within federal structures that legally recognize and formalize their international role, ensuring that paradiplomacy complements national diplomatic efforts. This variety could be called embedded paradiplomacy.

Although conceptually (and practically) relevant, in the real world this distinction is not always very clear. There is a grey zone between both. Protodiplomacy usually takes place within the confines of legality and does not necessarily exclude complementarity or coordination with the national level. At the same time, embedded paradiplomacy does not exclude an underlying autonomy-seeking political agenda.

Paradiplomacy represents the growing recognition that cities and regions, with their unique challenges and opportunities, can no longer be seen as mere spectators of international relations. Be it through cultural exchange, economic

<sup>10</sup> Leira & Carvalho, 2021.

<sup>11</sup> Farr, 2005.

<sup>12</sup> Acuto, 2013.

<sup>13</sup> Wolfe, 2000.

<sup>14</sup> Tavares, 2016, pp. 11 – 15.

<sup>15</sup> Duchacek, 1984.

<sup>16</sup> Hsu et al., 2017.

<sup>17</sup> McHugh, 2015.

cooperation, foreign direct investment, or environmental action, subnational governments play active roles in shaping the global agenda and prove that diplomacy is no longer the exclusive domain of nation-states.

## Science Paradiplomacy

In the face of mounting global challenges, from climate change to pandemics, the traditional framework of state-centric diplomacy has struggled to provide timely and effective solutions. The urgency of these issues demands forms of scientific collaboration that transcend national borders, and science paradiplomacy has potential to be a key instrument. Science paradiplomacy is a platform for subnational governments to harness scientific collaboration and knowledge to shape international policy and contribute to global governance. Science paradiplomacy can thereby use the science diplomacy tools at the (sub-national) regional level<sup>18</sup>, including: bilateral science & technology cooperation agreements (provided national constitutions allow), opening of regional research funds to third country involvement, sending science ambassadors, etc.

The distinction between protodiplomacy and embedded paradiplomacy, as explained above, is also relevant for science paradiplomacy, especially at the (sub-national) regional

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level. For example, while the Catalonian model with Catalonia International, and formerly the Public Diplomacy Council of Catalonia – DIPLOCAT, might be or have been closer to protodiplomacy, the Flemish model, with its diplomatic machinery active in the areas of science and innovation, next to culture, education, tourism, and trade and investment promotion, is closer to embedded paradiplomacy. Sometimes entities can position themselves on different points of the protodiplomacy – embedded diplomacy spectrum within the same country. In the United States, embedded paradiplomacy is the norm, with states like New York (Empire State Development), Texas (Economic Development & Tourism Office), and Massachusetts (Office of International Trade and Investment), inter alia, actively engaging in science paradiplomacy through their international offices facilitating

cross-border scientific partnerships and innovation. However, when the Trump administration pulled the country out of the Paris Agreement in 2017, states and cities like California and NYC upheld their climate goals. When science diplomacy is deployed to advance the objectives of sub-national regions and cities, it has also been referred to as hybrid diplomacy.<sup>19</sup>

At the city level, the C40 Cities Climate Leadership Group is a prime example of science paradiplomacy in action. This network of 96 cities, representing 8% of the world's population and a quarter of global economic output, collaborates to implement sustainable policies aimed at reducing greenhouse gas emissions. The group operates with a science-driven approach, establishing measurable goals and facilitating international knowledge exchange. Through the alignment of local initiatives with scientific research and international goals, like the SDGs, cities such as Rio de Janeiro, New York, and Paris have taken proactive roles in mitigating climate risks, even when national governments have been slow to act.<sup>20</sup>

Another notable case is the Global Covenant of Mayors for Climate & Energy (GCoM), a coalition launched under the auspices of the C40 that brings together 12,500 cities and regions worldwide to develop strategies for climate resilience. Through this network, local leaders are able to engage directly with scientific experts and construct a bottom-up

approach to mitigate risks from climate change. This horizontal alignment between subnational actors enhances their capacity to address local-global challenges whilst also strengthening their ability to influence vertical policy frameworks. The GCoM represents multilateral science

paradiplomacy. Alongside that, there are myriad examples of bilateral science paradiplomacy, such as the partnership between Jakarta and Rotterdam, two flood-prone cities, that exchanges expertise and experience in water management.<sup>21</sup>

Urban innovation ecosystems are key in science paradiplomacy. Cities with robust scientific and technological infrastructures, such as Barcelona, are becoming leaders in addressing global challenges by fostering multi-stakeholder partnerships. These ecosystems, which attract human and financial capital, are best positioned to facilitate collaboration between the scientific community, public institutions,

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<sup>19</sup> Van Langenhove, Shendrikova & Mays, 2024.

<sup>20</sup> Lee & Koski, 2014.

<sup>21</sup> Forster, 2013.

<sup>18</sup> Van Langenhove, 2017, pp. 12-17, 19.

the private sector, and civil society. In 2018, Barcelona's innovation ecosystem launched a comprehensive diplomatic strategy, embodied by its SciTech DiploHub, demonstrating how a city can leverage its scientific and technological assets to engage globally and address pressing international issues.<sup>22</sup> By formalizing city-led science diplomacy as an institutional practice, Barcelona advances its local interests on the international stage while encouraging open interaction among internal stakeholders. This strategy reflects the essence of science paradiplomacy: subnational governments lead science-driven initiatives that transcend borders and contribute to global governance.

When it comes to pandemics, cities are often the most affected. During COVID-19, as Li et al. point out in the case of China, "capable local leadership is indispensable for controlling the coronavirus epidemic, yet local governments' approaches are varied".<sup>23</sup> The best cases of pandemic response at the local level can vertically inform national plans, while horizontally informing other subnational regions around the world. This can be seen as science in diplomacy, as scientific knowledge, such as epidemiological data and public health guidelines, is integrated into the diplomatic processes shaping local, national, and global pandemic responses.

It also embodies science for diplomacy as local scientific collaboration—whether through research institutions, hospitals, or universities—can serve as a platform for building diplomatic relations. And it can also be seen as diplomacy for science because diplomatic actions, such as international agreements on public health cooperation sharpened by local knowledge, can pave the way for scientific collaboration and resource-sharing and enable local governments to better respond to health crises.

The Latin American Subnational Innovation Competitiveness Index offers a valuable framework for understanding science paradiplomacy, as it highlights how subnational regions actively contribute to global innovation through their local capacities.<sup>24</sup> The assessment of factors like human capital, research output, and innovation capacity shines light on how regional strengths drive cross-border scientific collaboration.

<sup>22</sup> Roig et al., 2020.

<sup>23</sup> Li et al., 2021.

<sup>24</sup> Lázár et al., 2023.

These regional entities are increasingly participating in science diplomacy (even if not necessarily called such explicitly) through partnerships and exchanges, and act as key players in global innovation networks, thus reinforcing the role of subnational actors in shaping international scientific agendas.

Finally, science paradiplomacy can take the form of engagement of regions and cities with multilateral science-based or science-producing agencies such as UNESCO, United Nations University (UNU), International Telecommunication Union (ITU), World Meteorological Organization (WMO), World Health Organization (WHO), etc. UNESCO, for example, has received funding from Jeju Province (South Korea), Trieste (Italy), Liptako-Gourma Authority (Mali, Niger, Burkina Faso), Flanders (Belgium), and Bethlehem (Palestine), among many other sources.<sup>25</sup>

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## Conclusion

The scientific arena, just like other areas of non-traditional diplomacy (cultural diplomacy, digital diplomacy, etc.), offer opportunities for the involvement of (aspiring) paradiplomatic actors as they might be less occupied or dominated by national diplomatic actors. At the same time, science diplomacy by sub-national actors might be explained by the visible local importance of certain science players (e.g. universities, innovation clusters) and/or facilitated by decentralized or devolved competences in this area to sub-national governance levels.

As globalization and localization continue to evolve in a symbiotic relationship, science paradiplomacy offers a powerful platform for addressing global challenges at both levels. Subnational actors, empowered by scientific collaboration and policy innovation, are uniquely positioned to drive the future of international relations. Whether it's through climate action, technological innovation, or public health,

<sup>25</sup> <https://core.unesco.org/en/sources-of-funding>

science paradiplomacy offers a pathway for cities and regions to respond to global issues while empowering themselves through creating sustainable and inclusive solutions for a rapidly changing world. Benchmarking and ripple effects may further amplify the impact of science paradiplomacy.

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