

2. Science Diplomacy Is en Vogue

This chapter provides an introduction to science diplomacy, the key topic of this study, by critically reviewing literature on the subject to establish an in-depth understanding of the concept and identify how it is analytically framed. This helps to identify gaps in the literature and creates an entry point for this work. This chapter first traces the development of the notion of science diplomacy as it stands (section 2.1). Next, there is an attempt to define science diplomacy and identify the key assumptions that guide the concept. In addition, the widespread contemporary use of this instrument is outlined, thereby revealing that it draws strongly on normative claims (section 2.2). Furthermore, to shed light on the governance of science diplomacy, this chapter unveils key actors in science diplomacy (section 2.3) and their rationales behind adopting this concept (section 2.4), as well as the governmental toolbox used to accommodate science diplomacy (section 2.5). In combination, these three aspects characterise and focus attention on the body of knowledge on the governance of science diplomacy, while also identifying its limits and blind spots. Finally, this chapter critically reflects on the prevailing use of science diplomacy as a concept (section 2.6). The main points of critique relate to the lack of empirical evidence for its claims and boundary aspects. As a consequence, the discourse seems to be normatively coloured and ultimately weakens the meaningfulness of the concept. In conclusion, this chapter underpins the current science diplomacy discourse; despite identifying apparent weaknesses, it proposes a meaningful way to analyse science diplomacy by focusing on a practical example, i.e., a selected instrument.

2.1. Science Diplomacy and the Obama Administration

In recent years, the notion of science diplomacy has increasingly gained momentum. Drawing on science and diplomacy as two distinct elements⁴,

4 Diplomacy is defined as follows: “Diplomacy at its essence is the conduct of relationships, using peaceful means, by and among international actors, at least one of whom is usually governmental” (Cooper, Heine and Thakur (2013, p. 2)).

this concept is commonly considered a distinct governmental approach based on the assumption that the potential of science to be a vehicle to facilitate international relations is unrealised or under-realised (Flink & Ruffin, 2019), although these two domains seem to have “*have very different dynamics*” (Wagner, 2002, p. 409). The current discourse on science diplomacy appears to be strongly connected to the Obama administration in the USA in 2008/2009. Different sources point to Barack Obama’s famous Cairo speech (he was President at that time), which called for a range of measures to strengthen the *science in diplomacy* (Alberts, 2010; Burkhalter, D., 2010; Turekian, 2018). This event is commonly considered to have set the ball rolling and signalled the dawn of science diplomacy discourse as it stands⁵. Although, this interconnectedness of science and foreign affairs is not entirely new (see section 2.2.3, and cf. Turchetti, 2020), the Obama administration seemed to have triggered a process that reinvented this mutually beneficial relationship and enabled science diplomacy to gain momentum.

In response, a body of literature evolved at that time which mirrored these assumptions (although systematic accounts on reconstructing the development of the term are missing from scholarly literature, apart from the work by Ruffini (2017)⁶). One of the first contributions that explicitly refers to science diplomacy stems from Lord and Turekian (2007, p. 769). While the authors do not explicitly define science diplomacy, they refer to the pivotal role of science and technology as a) an asset to national development and b) responding to global competition. Furthermore, the authors elaborate that science diplomacy has always played a role in US foreign policy. Responding to a certain global scepticism towards US (foreign policy and) governmental institutions, the authors consider science to be a useful vehicle since “*science is, and should remain, outside the realm of politics*” (2007, *ibid.*). What is more, they argue that “[*s*]cientists are among America’s most effective diplomats” (2007, *ibid.*). Accordingly, science diplomacy is seen as a meaningful tool with which to contribute to image-building that improves the international perception of the USA.

5 The interconnectedness of science and foreign affairs is, however, not entirely new. On the contrary, it has proven to be a distinct element, for instance during the Cold War era; science became a key asset for foreign affairs, both despite and because of immense diplomatic tensions, certain instances of scientific cooperation were maintained to keep channels of dialogue in international relations open (cf. Turchetti (2020)).

6 For illustration purposes, see the Google insight developments for the term *science diplomacy* published by T. C. Wang (2013, p. 3).

In a later text, the authors reaffirm these objectives and define science diplomacy as “*scientific cooperation and engagement with the explicit intent of building positive relationships with foreign governments and societies*” (Lord & Turekian, 2009). The potential of science diplomacy is harnessed because science “*provides the common language to build bridges between cultures*” (Fedoroff, 2009, p. 10).

These early contributions set the scene for the notion of science diplomacy to develop and consider it to be a useful tool which serves as a bridge-building element and facilitates the initiation and maintenance of international partnerships. Besides fostering international cooperation, Fedoroff (2009) explicitly assigns a decisive role to science diplomacy in tackling global challenges, i.e., problems of the 21st century. To some extent, this constitutes a shift in or a broadening of the concept from initial objectives, such as image-building, to tackling global challenges. In 2010, the discourse on science diplomacy was consolidated due to the potential of science diplomacy. The American Association for the Advancement of Science (AAAS) and the Royal Society took a systematic approach to advancing and structuring this emerging notion; they provided a cohesive definition and conceptualisation of science diplomacy that (still) serves as a “*landmark*” (Van Langenhove, 2016, 2017) in the study of science diplomacy and which will be introduced in the next section.

2.2. Definitions

2.2.1. Conceptualisation by the Royal Society and AAAS

In an attempt to systematise activities at the intersection of science and diplomacy (although they were not new), the Royal Society and the AAAS (2009; 2010) developed a science diplomacy triad. In essence, this triad aims to conceptualise science diplomacy activities, which are understood as “*the symbiosis between the interests and motivations of the scientific and foreign policy communities*” (The Royal Society & AAAS, 2010, p. vi). This triad still serves as a sine qua non starting point in the conceptualisation of science diplomacy among scholars and practitioners alike. In fact, since 2010, almost every contribution to this debate has referred to this triad as a point of departure and has applied its basic characteristics when categorising science diplomacy activities. Three dimensions were proposed,

which describe and classify interaction between science and diplomacy and which are typically viewed as *science diplomacy*: science in diplomacy, diplomacy for science and science for diplomacy activities (The Royal Society & AAAS, 2010):

- *Science in diplomacy* is understood as providing scientific advice in relation to foreign policy. More specifically, this comprises the provision of up-to-date scientific information to allow for better-informed policy-making. National academies are viewed as playing a significant role in this process.
- *Diplomacy for science* involves facilitating and promoting international research and science cooperation; this encompasses strategic top-down and bottom-up approaches, which in essence draw on the idea that science has bridge-building characteristics. A prominent example of such a (joint) strategic international endeavour is the establishment of large-scale research infrastructures, such as the Large Hadron Collider at the European Organization for Nuclear Research (CERN)^{7 8 9}.
- *Science for diplomacy* assumes that science increases potential impact and operates as an element of soft power in international relations, as characterised by Nye (2008). This potential is particularly realised in those situations where traditional diplomacy tools, such as negotiating (Constantinou & Sharp, 2016, p. 14), have reached a standstill. Soft power, in relation to science for diplomacy, relies on “*its attractiveness and influence both as a national asset, and as a universal activity that transcends national interests*” (The Royal Society & AAAS, 2010, p. 11). Due to its neutral and non-political character, science can function as a tool for soft power¹⁰, which, “*if aligned with wider foreign policy goals [...] can contribute to coalition-building and conflict resolution*” (ibid.).

7 For an overview of the development of CERN, see Strasser (2009).

8 Large-scale research infrastructures are a distinct case in academic scholarship given the involvement of multiple countries. For more information, see Cramer and Halonsten (2020).

9 A more recent example, which is also subsumed under the diplomacy for science category, is the *SESAME* project (Synchrotron-light for Experimental Science and Applications in the Middle East). It was designed to promote international collaboration between countries that have a history characterised by conflicts. SESAME is often viewed as a response that aims to overcome these tensions. For more information, see Rungius (2020).

10 Although this is a key assumption, which drives science diplomacy dialogue and reflects a Mertonian understanding of science (see Merton (1974)), this neutrality is

Whilst the potential of science in foreign affairs is acknowledged, politicisation of science should be avoided (The Royal Society & AAAS, 2010, p. 15)¹¹. Despite their contributions to structuring and thus advancing the field of science diplomacy, the analytical sharpness of the three dimensions is contested (and has not significantly progressed during evolving scholarly discourse). While this typology provides a structure to describe certain activities, it lacks precision. To give an example, there is no specification of the extent to which science in diplomacy differs from other forms of scientific advice to policy-makers (cf. Maasen & Weingart, 2005a, 2005b)¹². It remains unclear which conditions are required for such scientific advice to be considered science diplomacy. Another aspect relates to the inclusion of individual international scientific cooperation as being an explicit science diplomacy activity, subsumed by the science for diplomacy dimension.

Again, the question of boundaries is relevant: is any kind of international scientific cooperation automatically an expression of science diplomacy? More specifically, this raises questions regarding intentionality and strategic action: Is science diplomacy intentional or a by-product and does it ultimately respond to a wider (national) agenda? Is a degree of diplomacy/foreign affairs/policy involvement necessary in order to label an activity as science diplomacy? These considerations are raised again in a further question: Who are the actors of (modern) diplomacy¹³ and what is the role of politics? Finally, it seems that diplomacy for science activities and

contested and relates to debate on the very altruistic understanding of science and its governance. While science is primarily driven by *Erkenntnisgewinn* (i.e. generating new knowledge) and academic freedom (Altbach (2001)), a certain degree of politicisation, in terms of specifying the framework conditions, cannot be out ruled (cf. Mayntz (1996); D. Braun (1993); Sartori (1960)). This is evident, for instance, in increased competitive third-party research funding (Hornbostel (2001); Gläser and Velarde (2018)) or the definition of thematic, societally relevant research priorities. Therefore, the assumption of the neutrality of science is contested (Ball (2021)). Despite this, contributions to this debate, such as Strasser (2009), show how Switzerland managed to neutralise (i.e. depoliticise) scientific institutions such as CERN.

- 11 This is a sensitive issue within the scientific community and there are some scholars who oppose the ‘*instrumentalisation*’ of their cooperation for political purposes (cf. Fähnrich (2015); Moro-Martín (2017)). This seems to be a question of boundaries and definitions: where does instrumentalisation begin and where are its limits?
- 12 The pivotal role of scientific expertise in international negotiations has, for instance, been pointed out by Skodvin (1994) and labelled as scientific diplomacy.
- 13 While some (practitioner-driven) scholarship assigns a great potential to scientists as diplomats (cf. Melchor (2020)), other scholars view this development critically, since diplomats have distinct skills and training, a certain habitus, that scientists do not typically possess (cf. Kaplan (2011)).

science in diplomacy activities impact each other, although this is not conceptualised in the framework. It can be assumed that, in order to increase their impact, diplomacy for science activities have not been carried out in a vacuum but were preceded by interaction within the scientific realm (which again suggests that science in diplomacy has taken place). The frequent use of the AAAS and Royal Society's definition of science diplomacy can be seen to reflect the success of this definition, at least in terms of classifying activities. Yet, for analytical purposes, it is vital to acknowledge the limitations of this framework and its potential pitfalls.

2.2.2. Contemporary Understanding of Science Diplomacy

Since 2010, inspired by the AAAS and Royal Society definition, the body of literature on science diplomacy has mushroomed and an increasing number of countries have jumped on the bandwagon and directed their attention towards science diplomacy activities (cf. Flink & Schreiterer, 2010; Turekian & Wang, 2012)¹⁴. As a response, new, and at times divergent, interpretations of science diplomacy emerged¹⁵. While science diplomacy is, in line with the AAAS and Royal Society, defined as “*the ways in which countries incorporate science into their foreign policy*” (Turekian & Wang, 2012, p. 4), other interpretations have emphasised the role of international positing and national branding¹⁶: “*the process by which states represent themselves and their interests in the international arena when it comes to areas of knowledge—their acquisition, utilization and communication—acquired by the scientific method*” (Turekian et al., 2015, p. 4). Compared to

14 To illustrate this, countries which adopted this approach early on include: Canada (cf. Copeland (2015, 2011)), France (Directorate-General of Global Affairs, Development and Partnerships (2013)), Germany (cf. Schütte (2006); Stiftung Wissenschaft und Politik and Alexander von Humboldt Stiftung (2007)), Spain (Government of Spain (2016)), Switzerland (cf. Cassis, I. (2019); Schlegel, Jacot, and Fetscherin (2011)), the United Kingdom (cf. Swire (2014)), to name a few. In addition, the European Union focused on this topic (cf. Moedas (01.06.15, 2016)) and funded three main research projects in this field. While these countries constitute the Global North, this topic also emerged in countries that are considered as belonging to the Global South, such as Brazil (cf. Almeida Domingues and Ribeiro Neto (2017); Ferreira and Oliveira (2020)), as well as in India, Pakistan and Iran (for an overview, see the *Science & Diplomacy* online volumes).

15 Witjes and Sigl (2015) even hypothesise that a new policy field is evolving at the intersection of research policy and foreign affairs.

16 See Raev and Minkman (2020), on branding as a tool for science diplomacy.

international science cooperation, science diplomacy should have an influencing and altering effect. In the view of Wang (2013, p. 5), “*the motivation for Science Diplomacy is to affect relationships*”.

Another recent yet less prominent attempt to structure, categorise and explain a country’s science diplomacy activities stems from Gluckman et al. and aims to advance prevailing typologies. The authors suggest distinguishing between science diplomacy activities according to their key rationales and focal activities. Three categories are revealed to that end: activities that focus on (1) a country’s domestic needs, (2) cross-border activities and (3) activities that are directed towards tackling global challenges (Gluckmann, Turekian, Grimes, & Kishi, 2017, p. 3). Gluckman et al. stress that engaging in science diplomacy activities must be understood as aiming to advance national interests (cf. Epping, 2020). In a similar vein, science diplomacy has also been defined

“as a multi-faceted series of processes and outcomes that bring science and diplomacy together in ways that recognize and seek to enhance the internationalized and collaborative nature of science and do so by engaging a wide range of science, policy, and non-governmental actors” (Sabzalieva, Sá, Martinez, & Kachynska, 2021, p. 152).

This quote summarises the dual aspirations of science diplomacy: to promote and enhance scientific collaboration, while also using science as a deliberate tool for international positioning. In other words, science diplomacy considers scientific collaboration to be a relevant vehicle and a non-traditional channel of communication that creates a novel path for diplomacy if political ties are weak (Flink & Schreiterer, 2010). The main discourse relies on the assumption that science is a universal language, that it draws on established and accepted methods and common objects of investigation, which are increasingly of a global nature, such as global warming (Fedoroff, 2009; Milkoreit, 2015; The Royal Society & AAAS, 2010). In even stronger terms, it is assumed that science diplomacy can facilitate relations between countries which have an otherwise antagonistic relationship and that it can build bridges when other channels of communication remain closed (Flink & Schreiterer, 2010; Hajjar, 2016; Turekian & Neureiter, 2012; Goodsite et al., 2016;).

Science diplomacy thus has the potential to improve international relations and might also revive traditional diplomatic practices that have run dry (Lord & Turekian, 2007) by facilitating (individual and structural)

science cooperation. The latter assumption in particular is coupled with the idea that science diplomacy has the ability to operate as an element of soft power (Nye, 2008; The Royal Society & AAAS, 2010). Consequently, some scholars suggest viewing science diplomacy as an explicit element of public diplomacy (Copeland, 2011; Fähnrich, 2013; Lord & Turekian, 2007)¹⁷. Various (advocacy) sources have claimed that scientists and scientific cooperation can have transformative powers and deescalate situations in highly politicised fields, as well as pave the way for (political) relations in pre-political spaces (Goodsite et al., 2016; Keerawella, 2016). This line of argument serves as the dominant explanatory pattern in the use of science diplomacy and appears to be its driving force¹⁸. Additionally, science diplomacy refers to scientific advice as being crucial in the contemporary world and as informing foreign affairs, while also presenting a new form of governance to tackle common global challenges and transmit shared values, such as academic freedom.

In line with these (normative) assumptions, notions of science diplomacy have found their way into a range of different fields;¹⁹ these include tackling the huge challenges of climate change (Milkoreit, 2015; Ruffini, 2018), arctic governance (Berkman, Lang, Michael, A., Walton, & Young, Oran, R., 2011; Goodsite et al., 2016) and the governance of the internet (Mansell, 2018). More recently, science diplomacy was considered crucial to managing the Covid-19 pandemic and there was a focus on intense exchange between scientists and policy-makers and the way that scientific insights informed the implementation of specific measures. One could even argue that the Covid-19 pandemic constituted an exogenous shock for science diplomacy since it highlighted the role of science to politics in an unprecedented way. (However, to play devil's advocate, this has also raised questions about its differences from other forms of scientific policy advice).

The widespread use of the notion of scientific diplomacy has led to increased reflection and discourse on the demarcation of science diplomacy

17 Public diplomacy is thereby understood to address “*the general public in foreign societies*” (Melissen (2005, p. 5)) with the aim of “*resolving international difficulties peacefully*” (ibid.). This quote reflects a mere glimpse of the complexity of prevailing discussions surrounding public diplomacy. Further scholarly contributions to the extensive and complex debate on this multifaceted phenomenon can be found in Melissen (2005b), Gilboa (2008), Gregory (2008) and J. Wang (2006).

18 Without being too detailed at this stage (see section 13.5 for a more elaborated discussion), this normative view has been strongly shaken up and disrupted by recent geopolitical events as a result of the Ukraine–Russia conflict (February 2022).

19 Davis & Patman (2015) provide an overview of other fields of application.

in relation to a range of different fields. What is more, recent geopolitical events can be seen as constituting an exogenous shock to the functioning of science diplomacy: they acted as a caesura for the concept's promises (cf. Schütte, 2022) (see also section 13.5). More specifically, the role of science diplomacy needs to be critically examined and possibly newly defined (by governments and their key actors). This relates to the limits and possibilities of science diplomacy activities as well as considering whether there need to be minimum conditions for science diplomacy to operate (institutionally). Apart from these conceptual implications, it remains to be seen whether these geopolitical events will also have financial implications for science diplomacy activities. Given increased public spending on hard power, the question arises of how (soft power) science diplomacy activities will be evaluated in this light.

2.2.3. The Long History of Science Diplomacy

The previous sections have demonstrated how the current understanding of science diplomacy developed and how this term is a new label that has been applied to practices which are by no means new (Ruffini, 2020a). In the past, the practice of science diplomacy, i.e., the interplay between science and foreign affairs, has in fact been intensely interwoven with countries' histories and foreign affairs. To illustrate this, advancements in science (and technology) have been intertwined with international politics, as manifested in the Cold War era (Turchetti, 2020). The Cold War was particularly characterised by a race for technological advances alongside ideological clashes, which impacted both national and foreign policies. In retrospect, Turchetti (2020) considers these developments to be science diplomacy and, more specifically, also wartime diplomacy. In addition, scholarly literature has drawn attention to the role that science has played in international affairs. Skodvin (1994) examined the pivotal role of scientific expertise in international negotiations drawing on the example of climate change; she refers to "*scientific diplomacy*" and reaffirms the crucial role of scientific advisory bodies in international politics.

Similar examples of interactions between science and (foreign) policy can be found in the work of Adamson and Lalli (2021), who apply a

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historical perspective²⁰. Hence, the interaction between matters of science and technology and foreign affairs has a long tradition in terms of establishing frameworks for scientific activity (Wagner, 2002), providing expertise (Skodvin, 1994) or serving as a bridging element, as in the case of the Cold War. Some studies suggest that since the Cold War era, scientists role in and ability to influence foreign affairs has diminished (Skolnikoff, 2001); however, other research highlights the recent pivotal role of science and technology in the light of globalisation trends (Stein, 2002), and the rise of new communication technologies (C. Weiss, 2005). Wagner (2002, p. 409) supports this argument: “*Science represents a potentially powerful tool for improving international relations, and learning to use it may benefit both science and international affairs.*” Hence, what is now considered to be science diplomacy did not emerge in a vacuum but instead has its roots in a tradition of science and foreign affairs interaction. However, this discourse seems to have been revitalised by the Obama administration.

2.3. Science Diplomacy Actors

Now that the prevailing understanding of science diplomacy has been outlined, attention should be paid to the actors of science diplomacy and their rationales. The previous section identified two key actor groups: governments and scientists. However, scholarly literature suggests that the scope of actors is wider: “*today, science diplomacy occurs via a fragmented, complex and networked cast of non-state actors, agencies and institutions*” (Legrand & Stone, 2018, p. 394). This is confirmed by Fähnrich, who characterises science diplomacy as being shaped by “*a complex interplay of government, academia, and other societal actors*” (2015, p. 1), while other sources refer generally to a broad array of actors (Sabzalieva et al., 2021). More specifically, there are references to traditional governmental actors in the realm of foreign policy²¹, such as ministries of foreign affairs. Flink (2009, p. 69) explicitly acknowledges that science diplomacy refers to foreign affairs governmental action in relation to science, research and development that is conducted by ministries of education and research, as well as ministries of foreign affairs. Thereby, science diplomacy is aligned

20 There are also studies which claim that science diplomacy dates back to the early 18th century (cf. Özkaragöz Dogan (2015)).

21 For more information, please see Axworthy (2013).

with purposive governmental action and refers to a multitude of goals and areas of activity, which sometimes even contradict each other (*ibid.*). Flink (2009) also suggests that a broader definition of actors would include intermediary organisations that act on behalf of ministries.

In the past, academies of science were also identified as actors in science diplomacy (cf. AAAS Center for Science Diplomacy, 2009; Hassan, ter Meulen, McGrath, & Fears, 2015; The Royal Society & AAAS, 2010), thus emphasising their role of providing scientific advice to policy-makers and international research organisations. What is more, academies of science were viewed as nuclei for science diplomacy (Quevedo, 2013). In line with the definition of the AAAS and the Royal Society, other sources have expanded the scope of actors of science diplomacy to include non-traditional actors of diplomacy (cf. Cooper et al., 2013), such as individual scientists (cf. Carosso, Ferreira, & Mostajo-Radji, 2019; Fähnrich, 2015; Melchor, 2020); this idea has been contested since it raises the question of intentionality and the capability of an individual scientist to act on behalf of a state or, in other words, to be an agent operating in the national interests. This leads to further questions about how far scientists can (and wish to) operate according to a political agenda (cf. Van Langenhove, 2017)²² and whether or not they consider themselves to be agents of science diplomacy. Despite a proliferation of actors on the science diplomacy stage, traditional diplomacy scholars (Cooper et al., 2013) would be critical of this since they argue that individuals and members of civil society cannot be considered diplomats due to their lack of specific skills.

In a broader context, considering who should be regarded as actors of science diplomacy raises several conceptual questions that remain largely unanswered: Who do policy-makers consider to be actors of science diplomacy? Do these actors consider themselves to be actors of science diplomacy? Have they internalised this role? Or are there discrepancies in how such roles are viewed? Furthermore, there are questions about how non-state actors regard science diplomacy (individual understanding vs. political/national understanding) and whether these approaches converge

22 Van Langenhove (2017) distinguishes between explicit and implicit science diplomacy to grasp this complex and fluid concept. In doing so, he argues that only explicit forms should be regarded as science diplomacy rather than sporadic exchange outside interaction frameworks. Explicit science diplomacy encompasses activities and policies which are labelled by the actors themselves as science diplomacy or as diplomatic practices involving foreign affairs and science and technology policies.

in a coherent (national) science diplomacy strategy (and whether there is even a need for a coherent strategy)²³. These questions exemplify the potential implications of defining non-state actors. It has been observed, for instance, that science diplomacy definitions vary between actors in a national policy context (Flink, 2020b), which is reflected in the use of different framings (Schütte, 2007). To sum up, scholarly literature points to a range of stakeholders who may be key actors in science diplomacy, despite the fact that the criteria that qualify non-state actors as being actors of science diplomacy are rather vague. In addition, the rationales for non-state actors participating in science diplomacy have not yet been fully explored, except for the perspective of individual scholars (Fährnrich, 2013, 2015). This gap in scholarly research thus merits further study to explore and develop a distinctively actor-centred perspective on science diplomacy.

2.4. *Rationales for Countries to Engage in Science Diplomacy*

While there are few insights into the rationales for actors to participate in science diplomacy, scholarly literature sheds more light on the considerations that drive countries to engage in science diplomacy: national considerations constitute the principal motivation (Epping, 2020; Flink & Schreiterer, 2010; Gluckmann et al., 2017). More specifically, three goals that drive a country's science diplomacy activities have been identified²⁴ (Flink & Schreiterer, 2010, pp. 669–670):

- *Access* to resources in order to raise national capacities,
- *Promotion* of research and development attainments, i.e., national marketing in order to attract talent and therefore ensure high performance of national research and innovation systems,
- *Influence* on other political leaders, as well as public opinion.

Other authors propose slight adaptations to these rationales. For example, van Langenhove (2017, p. 9) refers to the different motivations for countries

23 Drawing on Schütte (2010), this constitutes a distinct characteristic of a successful science diplomacy strategy: a common understanding among all relevant actors that results in joint action.

24 These findings are largely based on empirical evidence gathered by looking at the Global North, i.e., developed countries. However, science diplomacy has also become a leading paradigm in politics in the Global South (Ferreira and Oliveira (2020)), which requires a reassessment of these rationales.

to engage in science diplomacy as: *attraction and access, cooperation, promotion and influencing*—this differs only to a marginal degree from the previous distinction. Attraction and access also aim to increase national capacities and attract foreign talent. Cooperation aims to foster international collaboration between researchers and establish joint research outputs. Finally, promotion and influence aim to influence public opinion and/or decision-makers. There is a widespread assumption (in practitioners' literature) that science diplomacy activities create a win-win situation. Science for diplomacy is praised for "*its attractiveness and influence both as a national asset, and as a universal activity that transcends national interests*" (The Royal Society & AAAS, 2010, p. 11), thereby affirming its soft power role.

The idea of transcending national interests is also reinforced since science diplomacy activities are often considered to be tackling global challenges. This understanding, however, has increasingly been challenged in recent studies and considers only one side of the argument (Epping, 2020; Ruffini, 2020a). Ruffini (2020a), for example, locates science diplomacy activities between the poles of collaboration and competition and asserts the national dimension as being the dominant focus. He argues that while science diplomacy may on the one hand tackle (global) challenges, it must on the other hand be considered to clearly advance national interests. From a more empirical perspective, science diplomacy strategies can be considered to deal increasingly with transnational norms and values, and to promote values such as academic freedom (cf. Auswärtiges Amt, 2020c) (see also section 8.1.4).

2.5. The Science Diplomacy Toolbox

When it comes to governmental instruments in the science diplomacy toolbox, the picture is less distinct. As with the definitions of science diplomacy, the range of instruments that are considered to be instruments of science diplomacy have mushroomed in recent years. While previous taxonomies (Gluckmann et al., 2017; The Royal Society & AAAS, 2010) might serve as an element to also structure governmental instruments, attention should be paid to whether individual instruments are directed towards science diplomacy, or whether a holistic approach is followed. While the former seems rather selective, the latter points to a new policy initiative that is designed to approach science diplomacy strategically, thereby relying

on a mix of instruments (Epping, 2020). Scholarly literature refers to several instruments in the toolbox that are at the disposal of governments, although not all of them are new. For example, mobility grants, programmes facilitating research cooperation or measures to improve technology transfer and country promotion are all viewed as distinct tools (Flink, 2009). In a similar vein, bi- and multilateral (cooperation) agreements (Sabzalieva et al., 2021) that facilitate exchange between host and home countries or selected funding programmes (cf. Fähnrich, 2013), as well as science and technology agreements, have been referred to as instruments in the toolbox (Rüffin & Schreiterer, 2017a).

While these instruments are largely financial ones, which offer incentives to the academic community, countries also draw on institutionalised responses. As mentioned earlier, large-scale research infrastructures and projects, such as CERN and SESAME, are intended to bring together scientists from different countries to advance their fields of knowledge by creating a distinct organisation. Such institutions are often considered to be instruments of science diplomacy par excellence (Dohjoka, Campbell, & Hill, 2017; Rungius, 2020; UNESCO, 2021). In addition, new positions have been created within governments; for example, in 2021, Switzerland appointed a representative for science diplomacy (*Sonderbeauftragter für Science Diplomacy*) (FDFA, 2021), and Germany created a similar post (*Außenwissenschaftsbeauftragter*) even earlier in the 2010s. There have also been other unique national and institutionalised responses to science diplomacy, such as dedicated posts at the diplomatic representations, such as science attachés or, more recently, innovation attachés (this will be discussed further in chapter 3) (Flink & Schreiterer, 2010). In addition, new units have been created at the nexus of science, innovation and diplomacy, such as the Science and Innovation Centres (SICs) that are central to this research and which will be introduced in more detail in the next chapter (Epping, 2020). Lastly, awards have been granted for special science diplomacy activities, as in the case of Germany (BMBF, 2020a). The list of instruments could be expanded. As Flink and Schreiterer point out, there is no “one size fits all” approach to science diplomacy (2010, p. 675); instead a mixed picture emerges of approaches and instruments deployed by different countries.

The list of instruments, however, does not include lines of demarcation or a refined analysis (exceptions are the works by Epping, 2020; Sabzalieva et al., 2021). Boundary aspects are significant, and it is essential to ascertain what makes such science diplomacy instruments unique, for example, in

comparison to instruments that facilitate internationalisation efforts (cf. (De Wit, Hunter, Howard, & Egron-Polak, 2015; Huisman & van der Wende, 2005). With regard to science diplomacy instruments, the following questions remain open: Is it the strategic focus that makes such instruments unique? Or is it the actors involved, or the alignment towards wider science diplomacy goals? Are these instruments indeed novel and meaningful strategic (science diplomacy) instruments? It is particularly vital to consider these questions in relation to the practice of re-labelling certain activities to demonstrate responsiveness and engagement (cf. Epping, 2020; Flink, 2020b), rather than designing something new. In other words, although instruments might be labelled as science diplomacy, a substantial number of them are not new (in terms of their form and design); they may instead be subject to new framing. Scholarly literature, however, often seems to turn a blind eye to this aspect and provides few answers to the above questions. This ultimately calls for a clearer definition of instruments of science diplomacy to strengthen the body of knowledge on this concept and prevent it from losing its distinctness.

2.6. Challenges to Science Diplomacy Research

While the notion of science diplomacy has experienced a stellar rise among policy-makers and practitioners over the past 10 years, there are three key interconnected challenges regarding this concept, which have been partially addressed earlier in this chapter. To start with, although the previous sections might suggest otherwise, science diplomacy has not received widespread attention from academic scholarship. While an epistemic community seems to have formed around the study of science diplomacy, the notion has largely been driven by a strong advocacy group, which promotes a normatively coloured view of science diplomacy due to the lack of empirical evidence. For example, the majority of contributions to science diplomacy discourse opt for, what Sending et al. consider to be, an “*explanation by naming*” approach (2011, p. 534); this is a typical pattern of new forms of diplomacy; however, it is a misleading one. Sending et al. elaborate that for the study of (seemingly) new forms of diplomacy²⁵, solid analytical categories are needed to capture change compared to traditional

25 For an overview of new forms of diplomacy, see the work by Constantinou, Kerr, and Sharp (2016).

diplomacy as opposed to “*hanging the causal story to be told*” (ibid.). However, there appears to be a lack of analytical studies in academic scholarship on science diplomacy, as illustrated earlier regarding questions of actors and instruments; instead, there is a focus on an explanation by naming approach.

Notwithstanding the promising role that science can play in international relations, the vast majority of literature on science diplomacy parrots the leading narrative that science serves as a panacea to daily and international politics, although this is largely decoupled from empirical evidence. Accordingly, this discourse and body of knowledge has not advanced in an academic sense. There is, for the most part, a lack of solid conceptualisation, theoretical embeddedness (drawing on neighbouring fields and concepts) and robust empirical insights outlining explanatory mechanisms (Aukes, Ordonez-Matamoros, & Kuhlmann, 2019, pp. 829–830). Therefore, there is no element of predictability tied to science diplomacy discourse. Most literature only refers to the workings of science diplomacy in retrospective terms and there is a tendency to label situations as successful science diplomacy in hindsight. These retrospective contributions hence lack analytical depth and fail to identify explanatory factors and patterns to show how science diplomacy might function as an element that reduces conflict. Accordingly, the mechanisms associated with successful science diplomacy remain undisclosed.

Given the lack of critical attention that scholarly literature pays to science diplomacy²⁶ for many practitioners, the mere existence of this discourse seems to provide legitimacy. Science diplomacy appears to have become self-referential within the (practitioner) community since it creates a certain (cognitive) understanding and transmits an explanatory framework

26 There are limited critical discussions on the notion of science diplomacy. The works by Darby (2015) and Smith III (2014) are among the few publications that engage more critically with this topic, in addition to Flink (2020a); Epping (2020); Ruffini (2020b). Smith III argues that in scholarly literature, “*science diplomacy is assumed to be at worst ineffective but never harmful*” (Smith III 2014, p. 828). He critically assesses the conflict over NAMRU-2 (NAMRU-2 refers to the US Naval Medical Research Unit that was stationed in Indonesia and accused of espionage) and demonstrates in his case study that science diplomacy efforts can also backfire and lead to new conflict situations. This aspect is, however, largely neglected in scholarly literature as science diplomacy is generally assumed to be a win-win situation. Smith III considers “*strategic communication and exchange [...] elite influence and material incentives*” (p.825) to be crucial accompanying factors for a successful science diplomacy strategy.

that actors seemingly adhere to. Thus, the concept is normatively coloured, and characterised by a “*fervid perspective*” (Leese, 2018, p. 49); its prospects seem to spur the discourse and may explain its expansion to multiple domains.

Science diplomacy is often regarded as a silver bullet providing a potential solution to all sorts of problems and mobilising soft power; at the same time, there is a lack of empirical insights into the actual workings of this type of diplomacy. Flink (2020a) is among the more critical scholars in the field; he refers to sensationalist discourse and the “*romancing*” narrative of science diplomacy (Rungius & Flink, 2020). This lack of empirical evidence thereby leads to a rather paradoxical situation; the importance of science to international relations is highlighted while “*the scientific method is rarely applied to study science diplomacy*” (Smith III, 2014, pp. 829–830). In other words, “*the prevailing view that science diplomacy increases international trust and transparency rests on poor theory and weak evidence*” (ibid.).

This lack of evidence reveals a second weakness: there is no common understanding of science diplomacy leading to boundary issues. Science diplomacy serves as an umbrella term for a set of distinct policies and instruments (Epping, 2020; Flink & Schreiterer, 2010) at the intersection of science and foreign affairs. Likewise, it refers to a set of practices²⁷ which assign a particular role to scientists in relation to foreign affairs (Fährnich, 2015; Ruffin & Schreiterer, 2017b; Ruffini, 2020a), as well as to distinct governance arrangements or successful multinational endeavours which aim to ease national tensions (such as SESAME). The concept of science diplomacy hence seems to be a moving target with loose boundaries; as illustrated earlier in this chapter, it is increasingly used as a catch-all concept in different fields, (cf. Davis & Patman, 2015; Kaltofen, Acuto, & Blackstock, 2018). Kaltofen and Acuto argue that “*we could speak of science diplomacy as both practice and scholarship that unpacks that practice and where both inextricably intertwine but without agreeing what is and isn’t part of the study*” (2018, p. 9). Furthermore, science diplomacy is framed by a multitude of normative expectations and meanings among different actor groups (Flink & Ruffin, 2019; Flink & Schreiterer, 2010, p. 669; Ruffini, 2020b), even within the same country (Flink, 2020b), which makes it a moving target. While the concept is used by scientists, policy-makers and

27 Drawing on Sending et al. (2011, p. 530), diplomacy has traditionally been “*more the province of practitioners than academics*” and has been defined by its purpose or the skills that diplomats require, such as the art of negotiating.

non-governmental actors alike, it is understood in different ways, and there seem to be limited points of reference. This raises concerns about the generalisability and transferability of empirical findings.

A third weakness regarding the discourse on science diplomacy derives directly from the weaknesses discussed above: the notion of science diplomacy has turned into a value-loaded and self-explanatory concept which assumes a mutually beneficial relationship between science and diplomacy, as illustrated previously. This cognitive effect is strongly linked to the distinct, seemingly inherent characteristics of science: the universal language of science draws on established and accepted methods and common objects of investigation that are increasingly of a global nature. This line of argument serves as the dominant explanatory pattern for the use of science diplomacy and seems to be its driving force. To sum up, from an analytical point of view, these shortcomings are severe. The mainstream discourse of science diplomacy promotes a normatively coloured understanding that shows signs of a conceptual overstretch and risks becoming a hollow concept and an empty signifier (Laclau & Mouffe, 2014). This is reinforced by the largely normative debate on science diplomacy and its lacking theoretical embeddedness. Accordingly, there is a need for a meaningful conceptual and empirical entry point to the study of science diplomacy with the aim of overcoming the boundary issues described earlier.

2.7. *Conclusion*

This chapter served a dual goal: firstly, it aimed to shed light on the prevailing understanding of science diplomacy and secondly, it outlined the body of knowledge, in particular pointing to gaps in scholarly literature. The literature review ascertained the lack of empirical insights in relation to the study of science diplomacy; furthermore, in terms of a conceptual point of view, it identified insufficient definitions and unclear demarcations as problematic. In addition, there is a need for more solid criteria to help establish why certain activities should be identified as distinct science diplomacy activities. While science diplomacy has great potential as a vehicle for facilitating and improving international relations (although expectations may be somewhat over-optimistic), this chapter considered a number of aspects which have held back this concept. The contemporary debate on science diplomacy remains largely hypothetical, and the concept is used in an ambiguous way, mostly inspired by normative considerations rather

than elements of predictability. While this applies to general discourse on the subject, it also relates to more specific issues, such as the governance of science diplomacy. Despite the astronomical rise of science diplomacy, the body of literature and knowledge in this field is still in its infancy and there is still a lack of solid insights into aspects such as actors, stakeholders and underlying rationales. Furthermore, the conceptualisation of instruments is not yet sufficient. Accordingly, it can be concluded that scholarship has yet to establish robust insights into the governance of science diplomacy.

This study takes account of these shortcomings and is positioned in such a way that it follows a distinct analytical and empirical path in order to overcome these issues. Rather than approaching the notion of science diplomacy in general terms, it adopts an instrument-centred perspective to address this fluid discourse. To this end, this thesis focuses on Science and Innovation Centres (SICs) as a distinct and underexplored institutional response in the governmental toolbox (a detailed introduction to SICs can be found in the next chapter). Adopting this (somewhat inverted) perspective allows us to identify key actors and, in addition, in line with the theoretical approach, consider their rationales behind engaging with this instrument. The following aspects are analysed in detail: the development of a science diplomacy instrument, the institutionalisation of science diplomacy and the identification of key actors, and actors' rationales for engaging with the instrument. In combination, this facilitates analysing an instance of science diplomacy in depth while also being able to generalise findings in relation to a wider discourse (i.e., the governance of science diplomacy). In response to the literature reviewed in this chapter, for the purpose of this study, science diplomacy is understood as common intentional action between foreign affairs and science for a common goal.

