

Rethinking Sustainability within Science Diplomacy

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Abstract

This study investigates the seminal role of science diplomacy in contributing to the global paradigm of sustainable development. It advances a nuanced conceptual understanding of science diplomacy which markedly departs from the idealistic and prescriptive connotations which have in the past decade resulted in the conflation of science diplomacy with the concept of soft power. It is argued that the positivistic associations in attached to international science and its ability to improve geopolitical dynamics and international relations overlook the important and overlooked role that diplomacy plays in driving scientific collaboration and cooperation. This study therefore aims to illuminate a normative analytical perspective of diplomacy as a conduit for disseminating political and ideological narratives that give shape to international science initiatives in the first instance. Hence, this paper endeavors to enhance knowledge on Science Diplomacy by exploring key developments that can assist us in transforming it from what is primarily a positivistic concept into an analytically robust tool that can shed critical insight and unveil novel perspectives into complex geopolitical diplomatic histories.

1. Introduction

Science has been with us since time immemorial and the creation of mankind, although its advances and the speed of innovation differ from one generation to another. It is within the current uncertain and uncharted climate, that diplomats as managers of globalisation, have facilitated a science driven agenda to promote climate change prevention, waste management, sustainable development, foreign investment protection and development cooperation. In large waves to overcrowded cities in densely populated urban areas in search of new means of sustenance, serious environmental issues have arisen. It is argued that the positivistic associations are attached to international science and its ability to improve geopolitical dynamics and international relations overlook the important and overlooked role that diplomacy plays in driving scientific collaboration and cooperation to deal with current challenges [1], [15], [27].

Underlying causes include climate change, diminishing biodiversity, environmental collapse, habitat destruction, urbanization, waste disposal and scarcity of food and other critical resources [22]. Therefore, the exponential growth in human population and the consequent effects on resource management has led to the development of many environmental problems [29]. Hence, news headlines have brought attention to the effects of human activities on the environment in such well-documented cases as the impacts of toxic waste dumping at Love Canal, New York in the United States; the Chernobyl nuclear fallout in Ukraine; and the Fukushima Daiichi nuclear plant disaster in Japan.

Although there have been marked improvements in scientific research and clear progress has been made in understanding and documenting the causes of these global problems, political and socioeconomic dynamics have meant that national and international government agencies have been slow to respond to these potential deleterious risks. However, there are international environmental treaties, they oblige only those states that agree to comply with them. There is no international police force to enforce such agreements and as such, compliance to provisions and obligations of such treaties depends on the good faith of the states being regulated by the treaties.

With increased research on environmental issues and effective dissemination of such research findings, the public and many political entities have come to better understand the reciprocal relationship between economic activities and environmental problems. More importantly, key geopolitical developments in the form of science diplomacy initiatives alongside the 2030 United Nations Sustainable Development Agenda have created a social and political impetus for all states to take immediate action. This has resulted in the emergence of diplomats as ‘managers of globalization’ [3] and the practice of day-to-day diplomacy as central to the circulation of knowledge and transnational scientific networks [2]. Indeed, the practice of diplomacy and the service of diplomats is of vital importance if humanity is to actualize the international vision of sustainable development [3].

This paper will focus on developing a historical and conceptual understanding of Science Diplomacy and its potential to transform from a positivistic concept into an analytically rich tool that can assist in

uncovering geopolitical and diplomatic histories through novel narratives in the context of sustainability.

2. Literature review

2.1. Science diplomacy

In recent years, scholarship has increasingly engaged in a historical rather than reified approach to understanding the role and efficacy of science diplomacy in global relations [2], [26], [27]. This shift follows the conceptual framework of science diplomacy which first emerged in 2010 when the American Association for the Advancement of Science (AAAS) and the Royal Society convened to jointly characterise science diplomacy in a concerted effort to stimulate an academic understanding of science diplomacy so that it could be applied within foreign offices and international institutions [2]. The meeting between the two abovementioned institutions produced a multi-tiered understanding of science diplomacy: (1) science in diplomacy; (2) science for diplomacy; and (3) diplomacy for science [21]. Herein, the concept of science diplomacy was agreed to represent the efforts and contributions of scientific experts and scientific data in driving diplomatic action. By contrast, science for diplomacy was described and differentiated by emphasising the use of science as a means to promote diplomatic relations and initiatives. Thirdly, diplomacy for science was postulated to encompass the deployment of diplomacy and diplomatic practice as a means to promote international scientific cooperation [21].

Science is known as an evidence-based form to acquire knowledge by using a universal type of a transnational communication language that puts fundamental questions about the nature of things. This definition is similar to the one found in Copland's paper [9] who wrote that science is previous assumptions linked all effects to a cause which can be determined. From both definitions, it is clear that science is a way to define and understand fundamental facts about nature by using an international and common language to determine their origins.

On the other hand, *Diplomacy* is defined by [10] as a way to manage international relations between countries through dialogue, negotiation and compromise by representatives known as diplomat. Whereas Chatterjee added that "Diplomacy stands for the management of international relations, that is primarily state to state relations. 'Management' in this context would mean settlement of differences, which should be achieved by negotiation; the methods by which these are adjusted by ambassadors and envoys; the business or art of the diplomatist" [7].

In his explanation about diplomat's role in the past centuries, Ayad [3] stated that changes had been major

since their first role was 'matrimonial diplomacy' ... Then moved to dealing with disarmament and arms regulations, crime and drug abuse; human rights protection; climate change prevention; promoting sustainable development; conflict prevention; development cooperation; peace-keeping, peace-making and peace enforcement; protecting foreign investments; the movement of refugees on a mass scale and the fight against international terrorism. Although scientists and diplomats are not obvious bedfellows as described by Sir Henry Wotton, Science diplomacy is when epistemic community and diplomat meet to address many urgent challenges and issues that the planet faces by managing global commons and faltering public health system.

Science diplomacy can also be described as a practice, and some have advocated that this is the dominant view in the literature, based on practitioners' perspectives and requiring further empirical basis [23]. Moreover, science diplomacy as a practice involves the collection, synthesis, and presentation of evidence to international decision-making processes, joint research projects acting as a dialogue hub between nations, and scientific cooperation calling society to address humanitarian challenges [24]. The most recent example where science diplomacy played an important role is during COVID-19 pandemic. As stated by [30], "the pandemic, like any other global challenges, is both knowledge-intensive, in that it requires engagement with scientific knowledge for effective policymaking, and cross-border, in that it is not solvable by a single country acting alone". Therefore, understanding science diplomacy's dimensions and its three categories will unveil the accuracy of its application throughout the history of international relations and science and technology development.

2.2. Science in diplomacy

To achieve its purposes, diplomacy must take effective use of science through scientific advice, expertise and data. The former is used as an aid to decision - making in foreign policy to address global issues in international negotiation. In this regard, the scientific community would give policymakers with up-to-dates information on the dynamics of the Earth's natural and socio- economic systems, and identify where uncertainties exist or where the evidence base is inadequate, in order that informed decisions are made at both the national and international levels [21]. That is to say, increasing needs of science in diplomacy is a side effect of the present generation. Therefore, an unprecedented challenge for humanity is to making good decisions especially in global governance. Hence, climate change is a case to study how science interact with diplomacy to solve one of the most science intensive

issues. Here comes into picture Intergovernmental Panel on Climate Change (IPCC) and the United Nations Framework Conventions on Climate Change (UNFCCC). The former was created in 1989 by the world Meteorological Organisation (WMO) and the United Nations Environmental Programme. IPCC's mission 'is to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impact and options for adaptation and mitigation' (Principles Governing IPCC Work, Article 2). Milkoreit explains how the scientific body aggregates and synthesises existing knowledge on climate change and then provides a one directional information to the body of political decision makers- UNFCCC [19]. Therefore, the panel works as high international expertise body to inform policy maker with the latest about the climate change without making prescriptions. Since 1990, the IPCC released six assessment reports (AR1-AR6) and many other special reports that described trends and effects of greenhouse gases on earth's atmosphere and ecosystems.

The impact of science in the policy sphere is highlighted by the 'Carbon Credit' notions. The latter is a permit that represent the right to emit a certain amount of carbon dioxide or other greenhouse gases. Some states offset the limitations of their pollution by purchasing carbon credits from other states. Finally, the Climate is a public and common good, therefore taking decisive decisions should consider national interests and the long-term humanity's interests as a whole.

2.3. Science for diplomacy

Science diplomacy is the use of science to build and improve international relations between countries with tension or strain in official relations. These could be through exchanges of individual scientists provide a network that allows to strengthen towards mutual understanding among diverse nations. Another way to make science serving the diplomacy is by making science agreements or by creating new institutions. Science festivals and exhibitions are platforms to emphasis and highlighting common interests.

One of organisations that has been created in the light of science for diplomacy is CERN, the European Organisation for nuclear research. CERN is an intergovernmental organisation created in 1954. It currently has 22 member states and a network of 47 states in various relationships with the organisation. This organisation is discussed as an early example of institutionalised scientific cooperation [9], a paradigmatic example for the promotion of peace through science by bringing individuals and countries together and overcoming historical and political

fractures [21]. Therefore, CERN emerges as a useful case to promote the conceptual practice of science diplomacy.

Among the various UN-related organizations that acted as science for diplomacy actors, the International Atomic Energy Agency (IAEA), established in 1957, has been key to nuclear diplomacy. Besides its regulatory role, the Agency has been a leading sponsor of scientific studies on the health and environmental effects of nuclear and radiological incidents. Turchetti [26] elaborates further and extends this line of reasoning to the North Atlantic Treaty Organisation (NATO) wherein he argues that the emergence of scientific programmes and initiatives within the organisation were driven by diplomatic conditions that gave rise to the formulation of NATO in the first instance [26], but have since played an important role in promoting amicable relations between member states.

Therefore, these examples highlight the varieties of goals that drive science diplomacy initiatives which are located somewhere between promoting peace and global goals on one hand and serving national strategic and interests on the other hand. In addition to that, in global health research, diplomacy is used as a medium especially as a potent use of science that brings people together to solve common issues and deal with pandemics and global health challenges. In 1997 WHO established a Global Outbreak Alert and Response Network, and Global Public Health Intelligence Network. that was until March 2003 when the World Health Organisation (WHO) made an announcement about a new disease discovered (SARS) and since then the WHO played the role as the broker of communication and collaboration by giving central information about the epidemic SARS. The sharing sample across government is the coordinated information flow which accelerated the recovery in each situation of epidemic. However, a number of papers have questioned the ability of WHO and its institutions to deal with pandemics. especially after the puzzling and troubling response to current COVID-19 pandemic which shows a relative lack of global health cooperation [25].

Commenting on cooperation during pandemics, Lui [18] stated that the uniqueness of this epidemic is how scientific and government health groups cooperated to resolve this epidemic in record time. He added "...the time from ascertainment of the new clinical disorder to the sequencing of the genome of the offending agent was only six months". The same response was for Ebola, H1N1, MERS, ZIKA, and Ebola. The sharing sample across government and the coordinated information flow accelerated the recovery in each situation. However, a number of papers have questioned the ability of WHO and his institutions to deal with pandemics. Especially after the puzzling and troubling response to current

COVID-19 pandemic which shows a relative lack of global health cooperation [25].

2.4. Diplomacy for science

Diplomacy for science is when ambassadors and diplomats promote their national scientific community on the international stage and facilitate cooperation with other countries. Harding argued that diplomatic foundations are important to overcome technical challenges between countries "... New approaches were needed for a form of agreement and organisation that would allow partners with diverse political and legal systems to work together on a science experiment of this magnitude" [13]. In these regards, many international initiatives were permitted through science diplomacy. The first example is the International Geographic Year (IGY) 1957-1958, which was an unprecedented programme of scientific exploration of Antarctica continent. This programme included scientists from 12 nations at the beginning. Further 35 nations had joined the treaty in 1961. Since then, IGY saw the establishment of permanent scientific base in 2008.

Square Kilometre Array (SKA) project is a radio telescope including an array of antennas strategically placed in open areas free from 'radio noise' to relay information to two different central location in Australia and South Africa. Australia has superior radio silence and facilities well suited for low frequency research, whereas South Africa geographically is the ideal candidate for medium and high frequency analysis. Dewdney wrote that: "...the International Union for Radio Science URSI established a working group in 1993 to study the next generation radio wavelength observatory. Since that time, the effort has grown to comprise 19 countries and 55 institutes" [11]. This is a good example to illustrate diplomacy for science where Australian government by all means facilitate international scientific cooperation with south Africa to improve international relations.

Another successful example of diplomacy for science is the US science diplomacy with Arab countries. In Cairo June 2009, the US President Barak Obama delivered a crucial speech about a "new beginning" in numerous bilateral, regional and multi-national initiatives to expand science and technology engagement with Muslim world [6]. The US government since that speech nominated nine prominent US scientists to serve as Science Envoys to Morocco, Tunisia, South Africa, Egypt, Ethiopia, Indonesia, Kazakhstan, Uzbekistan, Bangladesh to find ways to strengthen partnership and to solve common science and engineering issues.

2.5. Sustainability in Science diplomacy

Science diplomacy is the key concept to implement and foster sustainability in achieving development internationally. Science diplomacy defined in the Madrid Declaration as a series of practices in which science, technology, and foreign policy meaningfully interact [30]. According to Leguey-Feilleux, 'Globalisation' has provided several pathways for scientists and researchers to collaborate in global environmental agendas and engaging with international decision - makers, without undue regard to any national political agendas [16]. The case in point is the active engagement of many non-governmental and intergovernmental organisation in calling attentions to environmental concerns based on scientific findings. This 'Track Two' diplomacy has been identified as a more flexible and forthcoming form of international relations by which science can exercise its freedom and best address societal benefits and community interests [12].

One example involving climate science feeding diplomatic negotiation at the UN Level is the Intergovernmental Panel (IPCC) on climate Change. Since 1988 the IPCC has reported the latest academic research on global warming. It is currently providing insights to governments at all levels on the policies and mechanisms through which climate mitigation and adaptation may be advanced with all scientific information that can be used to develop climate policies.

IPCC assessments are written by hundreds of leading scientists to inform diplomatic discussions and resulted in progressive commitments from countries covering scientific, technical and socio-economic assessment of climate change. From Kyoto to Paris, scientific advice has informed more assertive commitments to reduce greenhouse gas emissions [23]. Another concept comes along 'Environmental diplomacy', as political sciences are at the centre of those negotiations to handle environmental issues by nations states.

Sustainability is expected to be implemented as a policy package that aims to maximise the efficiency and the effectiveness of the social and physical infrastructure as well as searching for new technologies as an immense benefit of global survival and constructive future global development. all countries will be in need of new technologies to make the UN Sustainable Development Goals (SDGs) become a sustained reality on a global level. In the context of the difference at all level between global North and the Global south, sustainable development would remain an illusionary goal if not helped through deliberate sharing of wealth, particularly of the wealth of sciences and technological. In that regard, science diplomacy supports countries efforts to achieve the sustainable development goals (SDGs) using science and advanced technology for the common good of

humanity to address cross-border cooperation and partnership in sciences and technology [4].

Climate change is one of the most challenging issues the world is currently facing, as an emergency call to address the climate crisis with the latest available science by using science diplomacy initiatives. Therefore, science diplomacy has the power to influence decision - making and diplomacy process.

2.6. Science diplomacy in COVID-19 pandemic

During COVID-19, alliances have been at the centre of the international context, between donors and implementing country, governments, research agencies, international organisations, vaccine manufacturer and NGOs. working together with WHO and Coalition for Epidemic Preparedness Innovations lead the COVAX initiative to support the development and manufacture of COVID-19 vaccines as informed by WHO. In his paper, Bhattacharya explained that ‘vaccine science diplomacy’ (VSD) is a joint effort from scientists from two nations or more to lead research in order to discover life-saving vaccine or any other concerned technologies [5]. This new hybrid concept can be the medium between nation in conflict or war who have even different ideologies to engage together in a new technologies development process of life saving vaccine. Some narratives around vaccine donation stated that lack of donors by noting that countries that made the most COVID-19 donations are referred to ‘vaccine diplomacy’. Which undermined the humanitarian aspect and significance of sharing a life-saving product amid pandemics. Usher in explaining the sharing scheme of EU COVID-19 vaccine, argued that vaccine donation wasn’t a display of empathy between nations, however it was mainly framed as transactions in the scheme of vaccine diplomacy [28].

Vaccine diplomacy is a best opportunity for nations to build new relations by gaining markets and ideologies. A pure example of that is how China used a coercive diplomacy and intentions by its donations to Honduras in order to end recognition of Taiwan autonomy as a return of vaccines against COVID-19. China and Russia were dominating the process of vaccine in the world, since the Western countries were only trying to cope with vaccinating their nations without taking in consideration countries in need. Michael Leigh in his paper on the lessons learnt from the soft power used by China and Russia added that “The late rollout of the EU’s vaccine purchase and delivery scheme handed Beijing and Moscow a commercial and diplomatic opportunity that fitted their strategic narratives”.

That is to indicate that the circulation of knowledge via transnational scientific networks is not

beyond the purview of the economic, ideological and cultural instruments of foreign policy. These elements necessitate a deeper analytical exploration of the narratives that shape geopolitics and inform science diplomacy initiatives – especially so during an unprecedented period in human history that is marred by the COVID-19 pandemic and grave concerns over global sustainability. For example, an integrated version of science diplomacy is evidenced by Bhattacharya in a study that reflects upon the importance of vaccine science diplomacy in low-middle income countries (LMICs) [5]. The author refers to the Cold War to emphasise the importance of vaccines through the example of the prototype for oral polio and how it played it pivotal role in combatting the disease, promoting development and fostering stronger diplomatic ties between states [5]. In considering the COVID-19 pandemic, the author argues that India has actively pursued a vaccine science diplomacy that leverages the country’s standing as the world’s vaccine factory to improve diplomatic ties [5].

The case of China and Russia during COVID-19 race to vaccinate the world population is a case in point. In this regard, Lee showed how China’s vaccine diplomacy has dominated the production, marketing and distribution of COVID-19 vaccines [17]. China was sending its ambassadors to receive the vaccine at airports with remarkable ceremonies. Other example of Paraguay, who did not recognize China, introduced a bill to open relations with Beijing, which would mean cutting ties with Taiwan when the government was in need of vaccines in April 2020, as COVID-19 raged through Paraguay.

2.7. Science diplomacy as a soft power

The concept of science diplomacy is often invoked in reference to the Cold War as a means to draw positivistic attention that idealising science as universal and non-normative in its application. In this regard, the likes of Turekian [27]; Adamson and Lalli [2]; Turchetti [26]; and Ruffini [23] have all sought to shed light to varying degrees on the importance of developing a stronger understanding of the ‘other-half’ of science diplomacy. These authors assert that during the cold war, science was utilised to facilitate and advance narratives rooted in diplomacy. In particular, Adamson and Lalli [2] argue that during the height of the cold war, the United States of America deployed science as a form of cultural diplomacy. Herein, the deliberate advancement of the values of scientific freedom were used to advance a political and diplomatic narrative aimed at softening ideological differences. Turekian [27] adds that it was not until the Cold War that science diplomacy truly solidified its institutional presence with the emergence of UNESCO, IAEA, CERN and other institutions that worked tirelessly to maintain global

connectivity and structure such as WHO [27]. This then served as an important basis for diplomatic breakthroughs including global agreements such as the Montreal Protocol (1987) and the Intergovernmental Panel on Climate Change (IPCC). The former, which remarkably received universal ratification from United Nations (UN) member states to regulate ozone depleting substances (ODS) has effectively enabled ozone recovery whereas the latter operates as a leading global body in the ongoing efforts to mitigate climate change [27]. These examples highlight the continuous and evolving relationship between scientific and diplomatic activities with science advancing diplomatic objectives on a truly global scale.

Adamson [2] and Turchetti [26] clearly examine the harmful capacity of science diplomacy by shedding light on a relatively less known example that bring to the surface underlying economic and security implications associated with the concept. The authors did so by exploring American-Brazilian relations between 1945-1955. In the immediate post-war period, Brazilian efforts to develop nuclear capacity, as spearheaded by Admiral Alvaro Alberto were met with sharp consternation by the US. The US foreign policy response to Brazil's nuclear ambitions represented a combination of diplomatic practices rather than a demarcation of methods [26]. In other words, the US approach to the Brazilian pursuit of nuclear capabilities combined coercive (hard power) alongside persuasive and collaborative methods (soft power).

Although science diplomacy has been expressed as a concept that is co-constructed between scientists and diplomats, existing literature primarily conveys it as being shaped by the likes of scientists rather than diplomats. By departing from this sensationalist line of reasoning that conflates science diplomacy with soft power this research builds upon the recent efforts to re-frames science diplomacy by deepening understanding on the complex and multi-level contribution of diplomacy in advancing science diplomacy. These processes can be understood through normative and instrumental means wherein the aim is to enhance global science policy, inform policy at all levels of government and build common interests to global issues – all whilst balancing them with ideological narratives and self-interested state agendas that fall within the scope of broader international relations theory [23].

3. Methodology

The philosophy that guides this paper is that of interpretivism. The complexities and political dynamics that emerge from global issues and challenges of science diplomacy within the context of sustainable development make interpretivism an ideal philosophy.

The research approach to complement the above is therefore deductive. This is because the research builds upon an existing conceptual and historical understanding of science diplomacy in shaping geopolitical phenomena.

4. Discussion and Findings

It is immediately evident from the definitions of science diplomacy that the multi-tiered approach resulted in a convoluted and confusing understanding of science diplomacy. The definitions also altogether ignore the role of diplomacy in science and fail to emphasise that a central element of science diplomacy initiatives is that they often encompass multiple varied objectives [2]. The original rendering of the definition is thus one that has often been conflated with the concept of soft power first developed by Joseph S. Nye [20]. The risk of unabatedly equating science diplomacy with soft power has predictably produced the emergence of idealised performative examples in which science-diplomacy initiatives have overwhelmingly succeeded. For instance, CERN has on multiple occasions been described as a model for successful science diplomacy [15], [23].

However, the positivist underpinnings of the three-tiered definition are such that they do not promote an analytical understanding of the role of diplomacy in science. Instead, they serve to depict science as an inherently positive and apolitical endeavour [24]. Although the success of science-diplomacy endeavours such as those by CERN are undeniable, they nevertheless marginalise and relegate to the background our understanding of the political elements and diplomatic practices involved in such initiatives. The globally shared challenges of the 21st century however present an opportunity to unravel normative narratives on science diplomacy.

To highlight the future of science diplomacy to overcome the new challenges, Raworth stated that the importance to shift the current ideologies from linear to circular would have. Most of us who are living on our planet Earth at this point in the first half of the twenty-first century are aware that the twentieth century nation state is in the midst of radical transformation. The international media includes images of human families attempting to migrate to Western nations by a perilous journey crossing thousands of miles by land or an uncertain journey on unsafe boats by sea. They are willing to risk their lives to flee to a place where they hope to find relative economic prosperity, comparative environmental cleanliness, and a reasonable amount of personal freedom. They are struggling to flee from areas which are beset with military conflicts, famine, drought, environmental disasters, poverty and the illegal drug trade.

If we examine closely and impartially events of this century, it is clear that the problem of economic

disparity between, among and within countries cannot be solved by armed intervention; in fact, the problems have been proven to be compounded by armed conflict. Nor can the problem be solved by building walls to keep migrants and refugees out. For centuries, it has been proven that human beings find ways to scale over walls or tunnel under the structures to find other methods to escape horrendous living conditions. Some actions by national governments may bring short term gains in terms of stemming the tide of impoverished humanity, but government action or inaction frequently contributes to making the problems worse. It is now the time to recognize that only science diplomacy attempts to develop innovative economic programmes that can challenge these devastating problems. What are the underlying causes of the desperate conditions that currently exist in certain parts of the earth? The dire conditions are brought about and are compounded by many complex factors. Some of these factors include climate change, diminishing biodiversity, environmental collapse, habitat destruction, urbanisation, improper waste disposal, pandemic diseases, and scarcity of food and other resources.

At this moment in history, the international environment in which scientists, companies, governments and diplomats have to operate is changing dramatically. Is there a way through innovative sustainable economics to improve the natural environment, to halt pandemic diseases, to reverse habitat destruction, to curtail highly destructive weather patterns, and to improve food production? When examining the immense problems and the barriers to solutions, perhaps there is a tendency to turn away in despair. However, it is essential to realise that at the present moment, these issues are vital to preserving life in all parts of the earth. It is clear that a whole array of government actors, non-government actors and international networks require new ways of managing international politics and challenges. Moreover, innovative policies and economic actions through cooperation and collaboration between nations have become essential to meet the current sustainable development all at levels.

5. Conclusion

This paper has sought to critically advance a conceptual understanding of science diplomacy and how it can shed light on the important but often neglected role of diplomacy in driving science in the current context of emerging sustainability. It is argued that it is possible to unravel rich perspectives and narratives of geopolitical history that depart from positivistic and tautological interpretations of science diplomacy. In addition to that, it highlights the complex socioeconomic dynamics and various stakeholders that may potentially contribute to both

hindering and advancing efforts that aim to promote the environment and sustainable development. Therefore, the role of science diplomacy in addressing current challenges should comply to a large extent with the sustainability agenda fixed by the UN for 2030. Hence, scientists and diplomats should continue their innovative efforts to deal with disruptive technologies, and the challenges confronting the Earth Planet and facing humanity. As a result of the global spread of COVID-19 many countries moved from the Wealth of Nations to the Health of Nations which necessitated an integral disciplinary cooperation between governments and their population worldwide. This highlighted the important move of science diplomacy from being a minor branch of international relations unto a universal vital discipline.

To sum up, it is axiomatic that science diplomacy supports countries, international and regional organisations role and efforts in achieving the UN Sustainable Developments Goals.

6. References

- [1] Allan, R. P., Hawkins, E., Bellouin, N., & Collins, B. (2021). IPCC, 2021: summary for Policymakers.
- [2] Adamson, M., & Lalli, R. (2021). Global perspectives on science diplomacy: Exploring the diplomacy-knowledge nexus in contemporary histories of science. *Centaurus*, 63(1), 1-16.
- [3] Ayad, N. (2019). Science Diplomacy and Diplomatic Practice. *London: Diplomat Magazine*.
- [4] Bardy, R., Saner, R., & Yiu, L. (2015). *Conceptualizing and Operationalizing Sustainable Development Goals through System Theory Perspectives: Recommendations for the Post-2015 Targets*. CSEND Working paper: Geneva.
- [5] Bhattacharya, S., Saleem, S. M., Shikha, D., Gokdemir, O., & Mehta, K. (2021). Role of vaccine science diplomacy in low-middle-income countries for eradicating the vaccine-preventable diseases: Targeting the "LAST MILE". *Journal of Family Medicine and Primary Care*, 10(8), 2739.
- [6] Campbell, K. (2012). Total Legacy: The Stratford Metropolitan Area Masterplan. *Journal of Urban Regeneration & Renewal*, 5(4), 311-316.
- [7] Chatterjee, C. (2013). *International law and diplomacy*. Routledge.
- [8] Cuellar-Ramirez, P. (2021). Science Diplomacy for Climate Action and Sustainable Development in Latin America and the Caribbean: How Important Is the Early Career Perspective to New Governance. *Frontiers in Research Metrics and Analytics*, 6, 657771.
- [9] Copeland, D. (2016). Science diplomacy. *The SAGE handbook of diplomacy*, 628-641.

- [10] Davis, L.S., "Science diplomacy: new day or false dawn?", *World Scientific*, 2014.
- [11] Dewdney, P. E., Hall, P. J., Schilizzi, R. T., & Lazio, T. J. L. (2009). The square kilometre array. *Proceedings of the IEEE*, 97(8), 1482-1496.
- [12] Gore, M. L., Nichols, E. S., & Lips, K. R. (2020). Preparing scientists for science diplomacy requires new science policy bridges. *The Hague Journal of Diplomacy*, 15(3), 424-434.
- [13] Harding, T. K., Khanna, M. J., & Orbach, R. L. (2012). International fusion energy cooperation: ITER as a case study in science and diplomacy. *Science and Diplomacy*, 9.
- [14] He, D., Lui, R., Wang, L., Tse, C. K., Yang, L., & Stone, L. (2015). Global spatio-temporal patterns of influenza in the post-pandemic era. *Scientific reports*, 5(1), 1-11.
- [15] Höne, K. E., & Kurbalija, J. (2018). Accelerating basic science in an intergovernmental framework: Learning from CERN's science diplomacy. *Global Policy*, 9, 67-72.
- [16] Leguey-Feilleux, J. R. (2017). *Global governance diplomacy: The critical role of diplomacy in addressing global problems*. Rowman & Littlefield.
- [17] Lee, S. T. (2021). Vaccine diplomacy: nation branding and China's COVID-19 soft power play. *Place Branding and Public Diplomacy*, 1-15.
- [18] Liu, M., Bu, Y., Chen, C., Xu, J., Li, D., Leng, Y., ... & Ding, Y. (2022). Pandemics are catalysts of scientific novelty: Evidence from COVID-19. *Journal of the Association for Information Science and Technology*, 73(8), 1065-1078.
- [19] Milkoreit, M. (2015). Science and climate change diplomacy: cognitive limits and the need to reinvent science communication. In *Science diplomacy: new day or false dawn?* (pp. 109-131).
- [20] Nye, J. S. (2004). *Soft power: The means to success in world politics*. Public affairs.
- [21] Royal Society. (2010). New frontiers in Science Diplomacy - navigating the changing balance of power. *Conjuntura Austral*, pp. 9-34.
- [22] Raworth, K. (2017). *Doughnut economics: seven ways to think like a 21st-century economist*. Chelsea Green Publishing.
- [23] Ruffini, P. B., & Ruffini, P. B. (2017). *What is science diplomacy?* (pp. 11-26). Springer International Publishing.
- [24] Rungius, C., Flink, T., & Degelsegger-Márquez, A. (2018). State-of-the-art report: summarizing literature on science diplomacy cases and concepts. *S4D4C Project*.
- [25] Taghizade, S., Chattu, V. K., Jaafaripooyan, E., & Kevany, S. (2021). COVID-19 pandemic as an excellent opportunity for Global Health Diplomacy. *Frontiers in Public Health*, 9, 655021.
- [26] Turchetti, S. (2020). The (science diplomacy) origins of the cold war. *Historical Studies in the Natural Sciences*, 50(4), 411-432.
- [27] Turekian, V. (2018). The evolution of science diplomacy. *Global Policy*, 9, 5-7.
- [28] Usher, A. D. (2021). ACT Accelerator strains donors' aid budgets. *The Lancet*, 397(10290), 2137.
- [29] World Health Organization. (2015). *Waste and human health: evidence and needs: WHO meeting report 5-6 November 2015: Bonn, Germany* (No. WHO/EURO: 2015-5441-45206-64594). World Health Organization. Regional Office for Europe.
- [30] Young, M., Rungius, C., Aukes, E. J., Melchor, L., Dall, E., Černovská, E., ... & Moreno, A. E. (2020). The'Matters' of Science Diplomacy: Transversal Analysis of the S4D4C Case Studies.