Intermestic: Journal of International Studies
e-ISSN.2503-443X
Volume 8, No. 2, Mei 2024 (392-420) doi:10.24198/intermestic.v8n2.2

BORROWING ABSOLUTE AND RELATIVE GAINS TO SCIENCE DIPLOMACY TYPOLOGY: PROSPECTIVE AND RESTRICTIVE

Muhammad Fikry Anshori[1*], Mutiara Rachmadini Effendi[2]

[1]Faculty of Social and Political Sciences; Universitas Padjadjaran; Indonesia
[2]School of Strategic and Global Studies; University of Indonesia; Indonesia
*email: anshori0075@gmail.com

Abstrak

Diplomasi sains merupakan topik yang tengah berkembang di Hubungan Internasional. Kajian-kajian terkini mengritisi tipologi diplomasi sains tradisional (sains dalam diplomasi, diplomasi untuk sains, dan sains untuk diplomasi) karena mengabaikan aspek konfliktual dalam hubungan internasional, sehingga diperlukan tipologi lain yang dapat mengakomodasi aspek tersebut. Artikel ini berupaya untuk ikut mengembangkan tipologi diplomasi sains dengan meminjam konsep perolehan absolut dan relatif dalam Hubungan Internasional. Peminjaman ini menghadirkan tipologi diplomasi sains menjadi dua macam yaitu prospektif dan restriktif. Dengan metode penambangan teks, artikel ini meragakan tipologi diplomasi sains tersebut pada data-data daring dari pertemuan perdana Science and Technology in Society (STS) Forum 2004 dan pertemuan pertama East Asia Science and Innovation Area (e-ASIA) Joint Research Forum 2011. Artikel ini menemukan tipologi diplomasi sains menjadi prospektif dan restriktif membantu mempelajari aspek kerja sama dan kompetisi dari diplomasi sains aktor negara saja secara sistematis.

Kata Kunci: *diplomasi sains, perolehan absolut, perolehan relatif, Science and Technology in Society (STS) Forum, The East Asia Science and Innovation Area (e-ASIA) Joint Research Forum*

Abstract

Science diplomacy is an emerging topic in International Relations. Recent studies criticize the traditional typology of science diplomacy (science in diplomacy, diplomacy for science, and science for diplomacy) because it ignores the conflictual aspect of international relations. Therefore, there is a need for science diplomacy typology to accommodate that. This article seeks to contribute to developing science diplomacy typology by borrowing the concepts of relative and absolute gains in International Relations. The borrowing presents a typology of science diplomacy into two types: prospective and restrictive. With the text mining method, this article demonstrated the typology of science diplomacy using online data from the Science and Technology in Society (STS) Forum 2004 and the East Asia Science and Innovation Area (e-ASIA) Joint Research Forum 2011. This article found the typology of science diplomacy as prospective and restrictive helps systematically study the cooperative and competitive aspects of state actors' science diplomacy exclusively.

Keywords: absolute gains, relative gains, science diplomacy, Science and Technology in Society (STS) Forum, The East Asia Science and Innovation Area (e-ASIA) Joint Research Forum

Introduction

Types of diplomatic engagement keep growing, evolving, and expanding. For example, there are citizen diplomacy, digital diplomacy, public diplomacy, and many more. Another diplomatic engagement that recently emerged in academic discussion is science diplomacy. It was first outlined in 2010 by The Royal Society and the American Association for the Advancement of Science (AAAS). They described science diplomacy has three dimensions based on historical and contemporary examples. The three dimensions are informing foreign policy objectives with scientific advice (science in diplomacy), facilitating international science cooperation (diplomacy for science), and using science cooperation to improve international relations between states (science for diplomacy) (The Royal Society & American Association for the Advancement of Science, 2010, pp. v-vi).

The three dimensions above have been used as a typology to describe several cases of science diplomacy. One prominent publication is an edited book by Davis and Patman (2014). The book examines several examples of science in diplomacy, such as the Intergovernmental Panel on Climate Change, The Extractive Industries Transparency Initiative, and WikiLeaks. Next, the book discusses four cases of diplomacy for science: United States Science Envoys to the Middle East, the Second Global Plan of Action for Plant Genetic Resources for Food and Agriculture, the Antarctic Treaty, and The Square Kilometer Array Project. Last, the book explores the following cases of science for diplomacy: The All-Ireland-National Cancer Institute Cancer Consortium, the Global Research Alliance on Agricultural Greenhouse Gases, and the Science and Technology Research Partnership for Sustainable Development Program.

Recent studies argue that the traditional science diplomacy typology developed by The Royal Society and AAAS in 2010 is insufficient to examine current science diplomacy. There are two main reasons why it is under that criticism. First, the traditional science diplomacy typology only emphasizes the scope and objective of science diplomacy as addressing global challenges, which assumes science has transformative power (Rungius & Flink, 2020). Second, the traditional science diplomacy typology highlights practices based on cooperation and the pursuit of shared interests but ignores the competitive aspect of international relations (Ruffini, 2020). Both criticisms point out the need to address the limitations of the traditional science diplomacy typology by developing a new science diplomacy typology.

Several studies have further inquiry into the matter above. Ruffini (2020) endorsed a new science diplomacy typology by Gluckman et al. (2017), which emphasizes borrowing the national interest concept to allow a robust reformulation of the three dimensions from the previous traditional science diplomacy typology. Rüffin & Rüland (2022) expand the traditional science diplomacy typology with three levels of engagement (national, regional, and global) for their research on Arctic region strategies, the Agreement on Enhancing International Arctic Scientific Cooperation, and research activities on Svalbard. Rüland (2023) investigated how scientists and scientific managers from the United States, Iran, and Cuba in two different international scientific projects perceive science for diplomacy, its goals and effectiveness, and its distinction from international scientific cooperation.

Based on that background, this article aims to contribute to the growing scholarships of developing science diplomacy typology by attempting to borrow two concepts, which are absolute and relative gains. This article will proceed as follows to achieve the aim. First are literature reviews on the previous attempt to borrow concepts for developing a science diplomacy typology and the attempt by this article to borrow absolute and relative gains for developing a science diplomacy typology. Next is the research methods, which are about prepared systematic steps to demonstrate the applicability of the borrowed absolute and relative gains concepts for a typology of science diplomacy. Then, this article proceeds to do those steps by incorporating and analyzing various data in the results and discussion sections. Last, this article ends with a conclusion of the previous parts and recommendations from the authors.

Literature Reviews

Previous Attempts on Borrowing Concepts to Science Diplomacy Typology

The act of borrowing concept by scholars is quite common in International Relations. One notable example is Neorealism paradigm, where Waltz derives the paradigm's basic proposition from market scarcity and oligopoly theory of economy (Kirshner, 2022, p. 7). In the case of developing science diplomacy typology, there are two attempts to borrow

International Relations concepts. One is from Gluckman et al. (2017), where they borrow national interest. The other one is from Rüffin & Rüland (2022), where they borrow the level of analysis. The following paragraphs will review their attempt to borrow national interest and the level of analysis.

Science diplomacy typology needs to start with why a state makes any investment to support science diplomacy in the first place. That is the main foundation for Gluckman et al. (2017, p. 2) to create an alternative science diplomacy typology that differs from the traditional one, which they called three categories of science diplomacy. Using the national interest concept as the foundation, Gluckman et al. (2017, p. 3) picture science diplomacy as follows: Actions designed to advance a state's national needs (national needs), actions designed to address cross-border interests (common interests), and actions primarily designed to meet global needs and challenges (global interests). They also elaborate on the three categories of science diplomacy by giving some examples (See Table 1).

Table 1 – Alternative Science Diplomacy Typology by Gluckman et al.

No.	Categories	Examples
1	**National Needs**	Reputation, Security, and Economic
2	**Common Interests**	Disaster Management, Big Science, and Shared Technical Services
3	**Global Interests**	Sustainable Development Goals

Source: Adapted from Gluckman et al. (2017, p. 12)

From the three categories above, science diplomacy intertwines with a state's national interest directly or indirectly. Gluckman et al. (2017, p. 3) borrow the concept of national interest and parse it according to the state's motivation or reason in national, international, and global that guide its political decisions or actions to invest efforts and resources in science diplomacy. In the national setting, science diplomacy is for advancing only domestic needs on the international stage. Then, science diplomacy also fulfills states' national interests in specific bilateral or multilateral issues in both international and global settings. That means there is a greater focus on the immediate interest versus longer-term implications when state actors do science diplomacy (Gluckman et al., 2017, p. 9).

Several scholars prefer the attempt by Gluckman et al. (2017) to borrow the national interest concept for developing a different science diplomacy typology over the traditional typology of science diplomacy. One of them is Ruffini (2020, p. 4), who argues the assertion of national interests allows a clarified reformulation of science diplomacy. That is because the core of science diplomacy seeks to match and find a balance between advancing national interests and solving prevailing problems with science as the means or instruments (Ruffini, 2020, p. 4). In short, using the science diplomacy typology by Gluckman et al. (2017) shows how science diplomacy is an integral part of state actors' foreign policy and a primary engagement tool with other actors to solve problems using science.

Gluckman et al. (2017) complements the traditional typology of science diplomacy by The Royal Society and AAAS (2010). That is the basic proposition from Rüffin and Rüland (2022, p. 3) for developing a different typology of science diplomacy compared to The Royal Society and AAAS (2010) and Gluckman et al. (2017) in their article. Their typology consists of nine types of science diplomacy, and each type is cross-tabulated between the traditional three dimensions of science diplomacy and three levels of diplomatic engagement: national, regional, and global (See Table 2). Therefore, there is unilateral science in diplomacy (SiD), unilateral science for diplomacy (S4D), unilateral diplomacy for science (D4S), bi-/multilateral SiD, bi-/multilateral S4D, bi-/multilateral D4S, multilateral SiD, multilateral S4D, and multilateral D4S.

Table 2 – Alternative Science Diplomacy Typology by Rüffin and Rüland

Science Diplomacy Initiatives	Level of Engagement		
	National	Regional	Global
Science in Diplomacy (SiD)	Unilateral SiD	Bi-/Multilateral SiD	Multilateral SiD
Science for Diplomacy (S4D)	Unilateral S4D	Bi-/Multilateral S4D	Multilateral S4D
Diplomacy for Science (D4S)	Unilateral D4S	Bi-/Multilateral D4S	Multilateral D4S

Source: Adapted from Rüffin and Rüland (2022, p. 4)

While Rüffin & Rüland (2022, p. 3) agree with Gluckman et al. (2017) because the national interest is significant for cooperation and competition in international relations, they also have additional interpretations compared to what Ruffini (2020, p. 4) argued. Rüffin and Rüland (2022, p. 3) infer the typology of science diplomacy from Gluckman et al. (2017) is not just highlighting the existence of national interests in science diplomacy as stated by Ruffini (2020, p. 4) but also provide three levels of analysis for science diplomacy initiatives (science in diplomacy, science for diplomacy, and diplomacy for science). Therefore, Rüffin & Rüland (2022, p. 3) prefer to build up their typology of science diplomacy from the traditional typology of science diplomacy from The Royal Society and AAAS (2010) by combining it with the typology of science diplomacy from Gluckman et al. (2017).

Two recent publications cite the typology of science diplomacy by Rüffin & Rüland (2022). One publication is from Devyatkin (2022), who discusses the historical rivalry between the United States and Russia in the Arctic region. The other publication is from Zaika and Lagutina (2023), who explore the tension between governmental actors and the scientific community when dealing with Arctic governance. Devyatkin (2022) concludes it is challenging to initiate peaceful unilateral or bi-/multilateral SiD, D4S, and S4D because possible only when the United States and Russia are in a friendly condition. Meanwhile, Zaika & Lagutina (2023) argue there is a resilience and adaptability effort both by governmental actors and the scientific community in every level of science diplomacy because of changes in geopolitical conditions. Both publications show how the typology of science diplomacy from Rüffin & Rüland (2022) are suitable to picture the cases of science diplomacy in the Arctic region.

Three categories of science diplomacy, as the typology of science diplomacy from Gluckman et al. (2017), and the framework of nine science diplomacy types, as the typology of science from Rüffin & Rüland (2022), evolve the previous understanding of science diplomacy. Their alternative typology fully contributes to the study of science diplomacy because both address the flaw in the traditional typology of science diplomacy from The Royal Society and AAAS (2010), which only focuses on science and ignores the competition in international relations. While the attempt to borrow the national interests by Gluckman et al. (2017) and the level of analysis by Rüffin & Rüland (2022) helped develop science diplomacy typology, they still need to be addressed. That is because both borrowed concepts have limitations as a standalone concept in International Relations and also in the context of science diplomacy.

The concept of national interests is well-known in International Relations, especially in foreign policy and international politics. However, the national interests concept still suffers a notable limitation: the clarity of the national interests itself when used as an analytical framework. As cited by Burchill (2005, p. 29), Rosenau (1969) argues that the national interest is just a way of labeling and describing the ends of foreign policy, which does not specify every factor that affects a state to define its wants and needs. In addition, Bull (1977), as cited in Burchill (2005, p. 30), argues that the national interest is just a fact and does not explain how a state behaves in its foreign relations.

Furthermore, the clarity problem of the national interests also makes the concept usage more for rhetoric than analytics in science diplomacy. That means the national interests concept in science diplomacy is only to make science diplomacy sound more impressive, but without adding arrangement parts to form science diplomacy as a concept in an organized manner. That argument was from Flink (2020, pp. 362-363), who argued that state actors create a sensational promise of scientific discovery to attach their national interest to science diplomacy and self-legitimize the instrumentalization of science for political purposes. In other words, the national interest concept only serves to make science diplomacy easier to promote in practice but without adding a substantial contribution to resolve the criticism of the science diplomacy concept.

The level of analysis offers a valuable framework for examining how various actors are involved in international relations. However, it still has a drawback that can affect how to study or research International Relations. Walker (1993), as cited by Wight (2006, p. 106), argues that the level of analysis can be misleading because it implies a vertical ordering in which the higher or broader level is simply more important than lower or narrower levels. That may lead to a mistaken assumption when taking a particular level of analysis as a research focus because one level seems appropriate to explain international relations phenomena or cases without critical consideration (Wight, 2006, p. 118).

Some scholars consider the three levels of analysis (national, regional, and global) as a comprehensive framework to study science diplomacy. That is because the three levels of analysis allow an examination of different science diplomacy's modes of engagement from distinct points of view where it is possible to compare and contrast them (Rüland & Rüffin, 2024, pp. 3-4). While considered comprehensive, the three levels of analysis in science diplomacy have not yet incorporated the sub-national level. Kaltofen & Acuto (2018, p. 17) argued the rise of foreign relations among sub-state entities like municipality governments for science cooperation creates a need to split the sub-national from the national level. This article cannot find why Rüffin & Rüland (2022) did not split the sub-national level from the national level. However it is sufficient to make a point about the limitation of the levels of analysis in science diplomacy. The limitation is the variety of ways to split levels of analysis in science diplomacy with the possibility of disregarding one level over another.

Borrowing Absolute and Relative Gains to Science Diplomacy Typology

Many concepts exist in International Relations. Based on a book by Griffiths & O'Callaghan (2001), there are at least 150 concepts in International Relations. Another book by Griffiths et al. (2007) lists a total of 161, which is 11 more than the previous book. Both national interest and level of analysis, the concepts previously discussed, are included in the list of International Relations concepts of both books. Based on the list provided in those two books, this article attempts to borrow two International Relations concepts for developing a typology of science diplomacy: absolute gains and relative gains. The following paragraphs will elaborate more on that.

The concept of absolute gains is about how a state only concerned with its maximum payoff can get regardless of what other states will get. It describes how states only focus on what they will gain the most, which means each state will assess its welfare independently without considering the welfare of others (Burchill, 2022, p. 105). The absolute gains occur when a state sees its payoff as indifferent to what other states will get and does not care about other states increasing their wealth or power with their payoff (Kauppi & Viotti, 2020, p. 39). In short, every state is satisfied because each state earns something when interacting with each other in the international system (Kauppi & Viotti, 2020, p. 410).

Meanwhile, the concept of relative gains is about how a state concerned with the maximum payoff that other states will get over its own can get. It illustrates how states assess their welfare comparatively to each other by focusing more on what the others will gain and how much the others will gain (Burchill, 2022, p. 105). The relative gains happen when a state is not satisfied with its advancement in terms of wealth or power simply because other states will have much more capabilities in both terms with their payoff (Kauppi & Viotti, 2020, p. 39). In other words, every state will see the difference in its maximum payoff when interacting with each other in the international system (Kauppi & Viotti, 2020, p. 39).

The concepts of absolute gains and relative gains have two contrasting premises. Essentially, both are part of two different paradigms in International Relations. The first one is Neoliberalism, and the latter one is Neorealism. Neoliberalism is a reformulation of idealist liberal ideas in International Relations where the paradigm does not pursue the creation of world government for international peace but through other means: democracy, international trade, international cooperation, international institutions, and international regimes (Sørensen et al., 2022, pp. 47-48). According to Sørensen et al. (2022, p. 49), Neorealism is also a reformulation of realist thought where the paradigm does not rely on evil human nature as to why international peace is hard to achieve. Instead, the paradigm argues it is because the structure of international relations is anarchy and composed of states with different powers.

Two publications from 2022 use the absolute and relative gains concepts as part of the analytical framework for investigating international relations events. One is by Yeung & Quek (2022), who surveyed the American public on the 2020 trade war between the United States and China. The other one is from Alhammadi (2022), who seeks to describe cooperation and competition among international relations actors during the global COVID-19 outbreak. Yeung & Quek (2022) show how the absolute and relative gains concepts contribute to public opinion of the trade war and how relative gains become the predominant understanding of the American public stance and preference for doing trade with foreign states. Alhammadi (2022) shows how the absolute and relative gains concepts, each as part of Neoliberalism and Neorealism, help to categorize significant actions taken by China, the European Union, India, the United States, and the World Health Organization to mitigate the pandemic.

Based on the four paragraphs above, there are three merits why this article attempts to borrow the concept of absolute gains and relative gains for developing a typology of science diplomacy. First, the absolute and relative gains concepts have exact contexts with contrasting premises on how a state sees its interaction with others, which are practical to represent the cooperation and competition aspects in international relations. Second, both concepts are part of paradigms (the absolute gains concept is Neoliberalism, while the relative gains concept is Neorealism), which shows their place in International Relations as an academic subject. Last, both are still in use for studying the latest international relations events (the 2020 United States-China trade war and the global

COVID-19 pandemic), which shows their relevancy and applicability for research purposes.

One demerit of borrowing the absolute gains and relative gains for developing a typology of science diplomacy is state-centric. That does not mean the scope of absolute and relative gains is nothing more than about the interaction between one state actor and other state actors. But the absolute and relative gains portray the state actor before everything else, just like how the national interest concept is for foreign policy ends of state actors. Prioritizing focus on state actors when discussing science diplomacy makes it more narrow because Echeverría-King et al. (2022) show that non-state actors, especially scientist diasporas abroad, are significant for initiating international scientific cooperation. Nonetheless, this article still attempts to develop a typology of science diplomacy by borrowing the absolute and relative gains because of the three merits.

Borrowing the concepts of absolute and relative gains to develop a typology of science diplomacy presents two types of science diplomacy. One type of science diplomacy is a state using diplomacy to attain its maximum individual payoffs in science (borrowing the absolute gains for science diplomacy). The other type of science diplomacy is a state using diplomacy to hinder others from advancing capabilities in science (borrowing the relative gains for science diplomacy). Two previous sentences define the two types of science diplomacy where the borrowed absolute and relative gains are part of a science diplomacy typology. However, it is not enough because the typology of science diplomacy needs additional characteristics to be applicable as a framework for studying science diplomacy.

Diplomacy is a concept with two main components: means and ends, where both means and ends in historical contexts and academic perspectives are diverse (Constantinou & Sharp, 2016). The two components can be the characteristics for elaborating the borrowed absolute and relative gains to science diplomacy typology. Therefore, deriving the concept of absolute and relative gains to means and ends of diplomacy presents the following characteristics for the two types of science diplomacy. The first type of science diplomacy (the absolute gains) has means of gathering numerous actors, and the end is attaining individual scientific advancement. Meanwhile, the second type of science diplomacy (the relative gains) has a means of recruiting chosen actors to hinder the scientific progress of other actors as part of the end.

This article also proposes names for the two types of science diplomacy above. The name for the first type, a state using diplomacy to attain its maximum individual payoffs in science (absolute gains), is prospective science diplomacy. The name for the second type, a state using diplomacy to hinder others from advancing capabilities in science (relative gains), is restrictive science diplomacy. The word prospective means relating to effective in the future, while restrictive means relating to restrictions (Merriam-Webster, 2023a; Merriam-Webster, 2023b). To finish this section, Table 3 below summarizes the typology of science diplomacy by borrowing the concept of absolute and relative gains, which are prospective and restrictive science diplomacy.

Table 3 – Prospective and Restrictive Science Diplomacy Typology

Characteristics	Science Diplomacy	
	Prospective (Absolute Gains)	**Restrictive** (Relative Gains)
Means	Gathering Numerous Actors	Recruiting Chosen Actors
Ends	Attain Own Advancement in Science	Hinder Advancement of Other in Science

Source: Developed by the Authors

Research Methods

This article chose two cases from Japan to demonstrate the applicability of prospective and restrictive science diplomacy typology, one for each type. Japan is a significant state actor as Japan was a pioneer in science diplomacy. That is shown by how Japan had concluded twenty-four agreements on scientific and technological cooperation with thirty-four countries by 2000, with the oldest one being in 1973 (Sunami et al., 2013, p. 2). The first case is the Inaugural Meeting of the Science and Technology in Society (STS) Forum in 2004, which is for prospective science diplomacy. Meanwhile, the case for restrictive science diplomacy is the First Meeting of the East Asia Science and Innovation Area (e-ASIA) Joint Research Forum in 2011. STS Forum is a platform initiated by Japanese government official Koji Omi (2014) to gather experts from science, government, business, and media backgrounds to discuss global science and technology issues. Sunami et al. (2013) describe e-ASIA as Japan's initiative for developing and supporting joint research projects in East Asia on a multilateral and multipurpose basis by inviting representatives from the Asia-Pacific region.

Both are historical cases of Japan's science diplomacy because both are the first time for Japan to initiated and inaugurated a large multilateral forum for science diplomacy. Both also fulfill the characteristic of a case for case studies in International Relations, which is histories with a point (Lamont, 2015, p. 128). However, both have not been given more attention for research purposes as the main object of studies in recent years. In 2023 and 2024, this article only found one book chapter from Guneratne (2023) and one journal article from Lundin et al. (2024) that gave them a portion as part of the discussion. Then, the historical documents used for the data are as follows: Brochure of the Inaugural Meeting of the STS Forum (2004a), Summary of Proceedings of the Inaugural Meeting of the STS Forum (2004b), Chairman's Summary of the First Meeting of the e-ASIA Joint Research Forum (Japan Science and Technology Agency, 2011a), and Keynote Speech of the Japanese Representative in the First Meeting of the e-ASIA Joint Research Forum (Japan Science and Technology Agency, 2011b). A total of four historical documents as the data for this article.

The number of data used is relatively small, which can present a constraint in demonstrating the applicability of prospective and restrictive science diplomacy if using a basic case studies approach to analyze it. The basic approach is a heavy description of collected textual data in chronological order that relies on the researchers only to do that (Yin, 2018, p. 219). Instead, this article used computer-assisted tools approach or text mining to produce a numeric value of the textual data and combine it with narration from the researchers that describes the meaning of the numeric value and the significance of the numeric value in the context of textual data. According to Yu et al. (2011, p. 732), the advantage of the approach is the numeric value of the textual data serves as an enrichment for the data itself by emerging a concrete value for a meaningful relation between the words in the textual data. That is also helpful for researchers to determine appropriate narration for the textual data because researchers can rely not only on what they see or read on the textual data but also on what computer-assisted tools produce.

This article used KH Coder 3 software as the computer-assisted tool for text mining. Text mining approaches using KH Coder 3 can unveil the association of every keyword in a text by calculating the Jaccard coefficient, a value between 0.0 and 1.0 that emphasizes whether or not specific keywords occur together (Higuchi, 2016, p. 47). KH Coder 3 can also visualize that by mapping the association of every keyword in form of a centrality co-occurrence network of words, where it shows the most important keyword and how it associates with the rest of the keywords (Higuchi, 2016, p. 51). Utilizing KH Coder 3 software, this article may present how the Inaugural Meeting of the STS Forum data reflects Japan's prospective science diplomacy and how the First Meeting of the e-ASIA Joint Research Forum data reflects Japan's restrictive science diplomacy.

Results and Discussions

Inaugural Meeting of the Science and Technology in Society (STS) Forum 2004 as Japan's Prospective Science Diplomacy

The STS Forum has forty founding members from higher education institutions or independent scientific communities, privately-owned or state-owned enterprises, and national governments or intergovernmental organizations (See Table 4). There are sixteen members from higher education institutions or independent scientific communities, six from privately-owned or state-owned enterprises, and eighteen from national governments or intergovernmental organizations. Most privately-owned or state-owned enterprise members are Japanese nationals, with a total of four. Meanwhile, the higher education institutions or independent scientific communities and the national governments or intergovernmental organizations are mainly foreign nationals, with eleven and fifteen members each. Those numbers show Japan was gathering numerous actors with various backgrounds, which is one of the characteristics of prospective science diplomacy.

Table 4 – STS Forum Founding Members

No.	Higher Education Institution or Independent Scientific Community		Privately-Owned or State-Owned Enterprise		National Government or Intergovernmental Organization	
	Name	Affiliation	Name	Affiliation	Name	Affiliation
1	Ahmed H. Zewail	Professor, California Institute of Technology	Etsuhiko Shoyama	President, Chief Executive Officer (CEO) and Director, Hitachi	Andrey A. Fursenko	Minister of Education and Science, Russia
2	Bruce Alberts	President, National Academy of	Henry A. Mckinnell, Jr.	Chairman of the Board and	Brichetto Arnaboldi	Minister of Education, Universities

		Sciences, United States		CEO, Pfizer	Letizia Moratti	and Scientific Research, Italy
3	François Gros	Honorary Permanent Secretary, Académie des Sciences, France	Hiroshi Okuda	Chairman, Toyota Motor	David King	Chief Scientific Advisor to the Government, United Kingdom
4	Gunnar Öquist	Secretary-General, Royal Swedish Academy of Sciences	Hiroyuki Yoshino	Director and Advisor, Honda Motor	David Sainsbury	Minister for Science and Innovation, United Kingom
5	Harriet Wallberg-Henriksson	President, Karolinska Institutet, Sweden	John Weston	Non-executive Chairman, Spirent	François D'aubert,	Minister Delegate for Research and New Technologies, France
6	Ismail Serageldin	Director, Library of Alexandria, Egypt	Taizo Nishimuro	Chairman of the Board, Toshiba	Guanhua Xu	Minister of Science and Technology, China
7	Jane Lubchenco	President, International Council of Scientific Unions (ICSU)			Hiroyuki Hosoda	Chief Cabinet Secretary, Japan
8	Jerome I. Friedman	Professor, Massachusetts Institute of Technology (MIT)			Hiroyuki Yoshikawa	President, National Institute of Advanced Industrial Science and Technology, Japan
9	Philip Campbell	Editor-in-Chief, Nature			Jeff Bingaman	Ranking Member, Committee on Energy and Natural Resources, Senate, United States
10	Phillip Yeo	Chairman, A*STAR, Singapore			John Marburger III	Science Advisor to the President, Director, Office of Science and

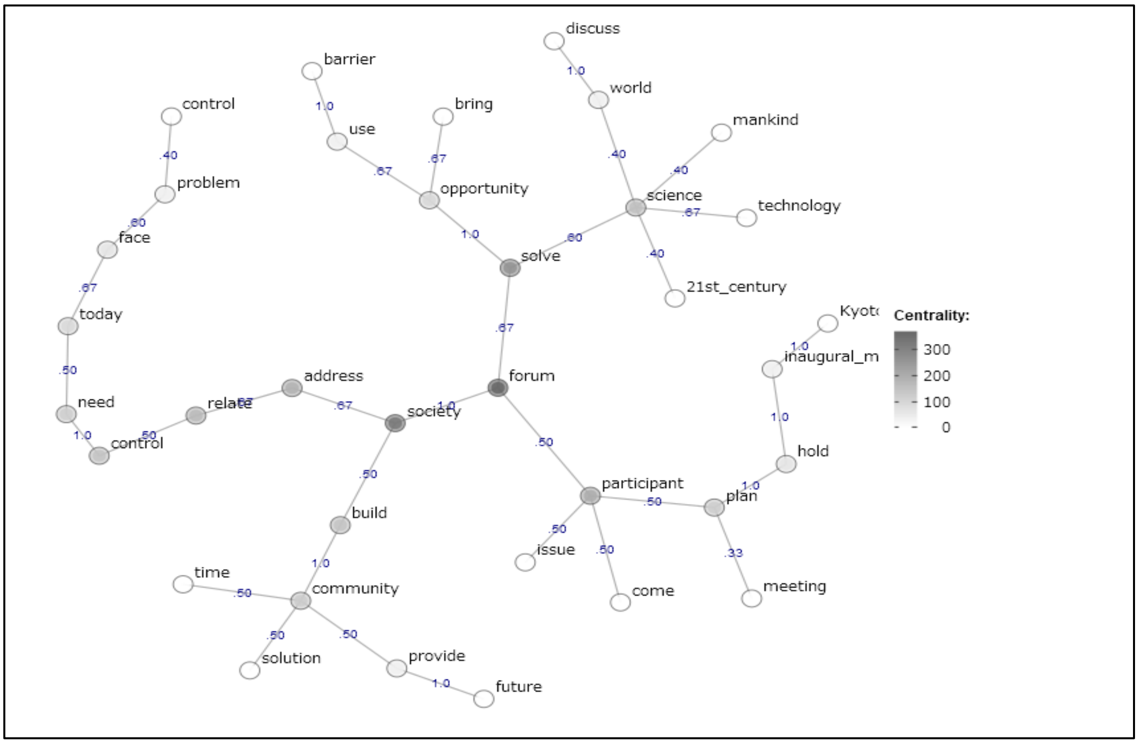
						Technology Policy, United States
11	Philippe Desmarescaux	Chairman, Scientific Foundation of Lyon, Biovision			Kazuki Okimura	President, Japan Science and Technology Agency
12	Robert May	President, Royal Society, United Kingdom			Kiyoshi Kurokawa	President, Science Council of Japan
13	Susumu Onegawa	Picower Professor of Biology and Neuroscience, MIT			Koji Omi	Member of the House of Representatives , Japan
14	Sydney Brenner	Distinguished Research Professor, The Salk Institute			Osamu Watanabe	Chairman and CEO, Japan External Trade Organization
15	Thomas Rosswall	Executive Director, ICSU			Philippe Busquin	Commissioner for Research, European Union
16	Yongxiang Lu	President, Chinese Academy of Sciences			Raghunaht A. Mashelkar	Director General, Council of Scientific & Industrial Research, India
17					Seung-soo Han	President, The 56th Session of the United Nations General Assembly
18					Taizo Yakushiji	Member, Council for Science and Technology Policy, Japan

Source: Adapted from the Inaugural Meeting Brochure (STS Forum, 2004a)

Koji Omi, the founding chairman of STS Forum, has a fundamental concept of what the forum should be all about, which first appeared in the brochure of the inaugural meeting of the STS Forum 2004. One central keyword and three main branch keywords can be inferred from the fundamental concept of the forum using the centrality co-occurrence network of words. The central one is *forum*, while the three main branch keywords are *participant*, *solve*, and *society* (See around the middle part of Figure 1). The keyword *participant*, with a Jaccard coefficient of 0.50 between the keyword *forum*, is about how the participants come to discuss issues and plan to hold the inaugural meeting in Kyoto and meetings once a year after that in the same city (Right side of Figure 1).

The keyword *solve* has a Jaccard coefficient of 0.67 between the keyword *forum* and two branch keywords: *science* and *opportunity* (Top side of Figure 1). The keyword *science* has a Jaccard coefficient of 0.60 between the keyword *solve*, and the keyword *opportunity* has 1.0. The first branch shows how STS Forum seeks to solve problems using science because science is a significant means in the 21st century, which the world needs to discuss. The first branch also highlights the intertwining between science and technology in the fundamental concept of the STS Forum. Meanwhile, the second branch shows how STS Forum seeks to solve problems by providing an opportunity to bring participants from various backgrounds and use it to seize down barriers in science and technology.

Figure 1 – Centrality Co-occurrence Network of Words in the Koji Omi's Fundamental Concept of the STS Forum 2004

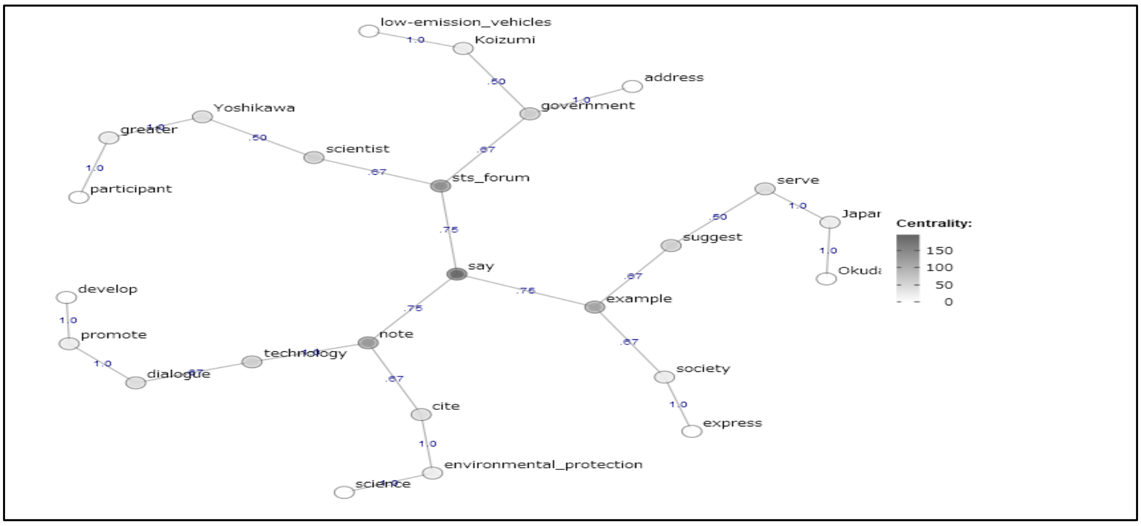


Source: Developed by the Authors using KH Coder 3

Society is the third main branch keyword in the fundamental concept of STS Forum, which has a Jaccard coefficient of 1.0 between the central keyword (Left side of Figure 1). The keyword has two branch keywords: the first is the keyword *build* with a Jaccard coefficient of 0.5 between the keyword *society*, and the second is the keyword *address* with a Jaccard coefficient of 0.67 between the keyword *society*. The first branch emphasizes how the STS Forum is a society-oriented forum with aims to build a community that just in time to provide solutions for the future. The second branch also emphasizes how the forum is society-oriented for addressing related problems, which today, the world needs to face and control by using science and technology.

Sorted from the highest to the lowest Jaccard coefficient between the central keyword, the three main branch keywords will be: *society* (1.0), *solve* (0.67), and *participant* (0.50). A Jaccard coefficient of 1.0 means a strong connection between the keyword *forum* and the keyword *society*, which is on one side because of the name *Science and Technology in Society*. On the other side, because of how elaborate Koji Omi positioned the STS forum as a platform for solving a whole part of society's problems using keywords such as *build*, *community*, *address*, *relate*, *control*, and *need* in the fundamental concept. That, in return, also show how Japan sees indifferent gains in science and technology between its state and other actors in the STS Forum because the world has the same problem.

Figure 2 – Centrality Co-occurrence Network of Words in the Summary of Japanese Representatives' Opening Address in the Inaugural Meeting of the STS Forum 2004



Source: Developed by the Authors using KH Coder 3

There were four Japanese representatives for the opening of the inaugural meeting of the STS Forum (2004b): Koji Omi (Member of the House of Representatives), Junichiro Koizumi (Prime Minister), Hiroshi Okuda (Chairman of Toyota Motor), and Hiroyuki Yoshikawa (President of the National Institute of Advanced Industrial Science and Technology). From the summary of their speeches, there is one central keyword (*say*) and three main branch keywords (*example*, *note*, and *sts_forum*) based on the centrality co-occurrence network of words (See around the middle of Figure 2). Each of the three main branch keywords has the same Jaccard coefficient, which is 0.75 between the central keyword *say*.

The keyword *example* has two branch keywords, *society* and *suggest*, and both of them have the same Jaccard coefficient of 0.67 between the keyword *example* (Right side of Figure 2). The first branch shows several examples of how Japanese representatives expressed appreciation for society in their opening address. The Japanese representatives are serious about that, as the Jaccard coefficient between the keyword *express* and the keyword *society* is 1.0. Next, the second branch refers to one of the Japanese representatives, Hiroshi Okuda, who suggests how Japan might serve as an example for others. The Jaccard coefficient between the keyword *serve* and the keyword *Japan* is 1.0, which indicates Okuda emphasizes that in the opening address.

The keyword *note* is the second main branch from the central keyword with two branch keywords: *cite* and *technology* (Left side of Figure 2). The first branch keyword (*cite*) has a Jaccard coefficient of 0.67 between the keyword *note*, while the second branch keyword (*technology*) has a Jaccard coefficient of 1.0 between the keyword *note*. The first branch shows Japanese representatives taking notes by citing how science contributes to environmental protection in their opening address. Meanwhile, the second branch implies Japanese representatives taking notes on the importance of developing and promoting dialogue on technology in their opening address. The Japanese representatives highlight the second branch more than the first branch in their opening address, based on how the Jaccard coefficient of the keyword *technology* is higher than the keyword *cite.*

Sts forum is the last main branch keyword in the opening address by Japanese representatives, which also has two branch keywords: *scientist* and *government* (Top side of Figure 2). The keyword scientist is about how Hiroyuki Yoshikawa, the President of the National Institute of Advanced Industrial Science and Technology, expects scientists to become greater or prime participants in the STS Forum. Then, the keyword government is about how Prime Minister Junichiro Koizumi highlighted the importance of addressing the environmental challenge faced by the world and every possible solution, such as low-emission vehicles. The keyword *scientist* and the keyword *government* have the same Jaccard coefficient of 0.67 between the keyword *sts forum*, which shows scientists and government have the same importance in the STS Forum based on the opening address by Japanese representatives.

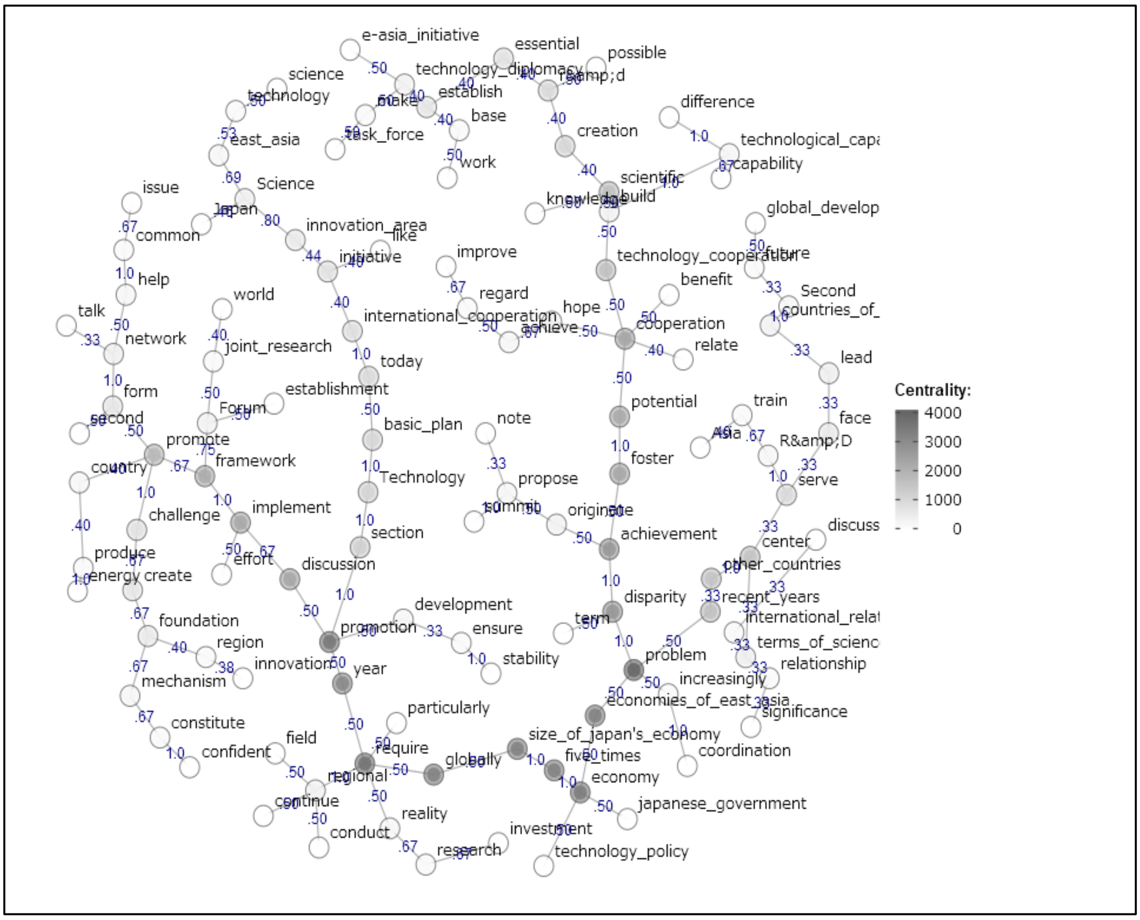
As previously mentioned, each of the three main branch keywords has the same Jaccard coefficient of 0.75 between the central keyword. Based on that same coefficient, there is proportional importance between the keyword *example*, *note*, and *sts_forum* in what Japanese representatives *say* in the opening address of STS Forum 2004. Considering also the previous finding on how Japan positioned the STS Forum as a platform for solving shared problems in the world, that proportional importance signifies Japan seeks to gain by being an example for others and taking note of the world's challenges and technology in the STS Forum where scientist and government come together. In addition, that was also highlighted with Japanese representatives mentioned the low-emission vehicles program in Japan, the scientific information exchange program in Japan, and their effort to build government-industry-scientist collaboration in medical and environmental fields (STS Forum, 2004b, pp. 3-4). Therefore, those findings show Japan was pursuing its advancement regardless of others, which is another characteristic of prospective science diplomacy.

The First Meeting of the East Asia Science and Innovation Area (e-ASIA) Joint Research Forum 2011 as Japan's Restrictive Science Diplomacy

The participants in the first meeting of the e-ASIA Joint Research Forum were Australia, Cambodia, India, Indonesia, Japan, Laos, New Zealand, Singapore, Philippines, Thailand, Vietnam, and the ASEAN Secretariat (Japan Science and Technology Agency, 2011a). Of the twelve participants, there were eleven participants representing states, and one participant representing intergovernmental organizations. The eleven states are from Asia-Pacific Region, where one is from East Asia (Japan), one is from South Asia (India), two are from the Pacific (Australia and New Zealand), and the rest are from Southeast Asia (Cambodia, Indonesia, Laos, Singapore, Philippines, Thailand, and Vietnam). Then, the main base of the intergovernmental organization (ASEAN Secretariat) is also in Southeast Asia.

While the forum was entitled East Asia, other states in that region, such as China and South Korea, were not represented in the meeting. Singapore's representatives also highlighted that in the first meeting of the e-ASIA Joint Research Forum by asking to receive feedback from the non-represented states (Japan Science and Technology Agency, 2011a). This article could not find official documents to confirm why other East Asian states did not have representation in the first meeting, even when the forum was entitled East Asia and had representatives from almost every part of Asia-Pacific. But by deriving from that, this article assumess that Japan was selectively inviting actors in the Asia-Pacific, which is one of the characteristics of restrictive science diplomacy.

Figure 3 – Centrality Co-occurrence Network of Words in the Takashi Shiraishi's Keynote Speech in the First Meeting of the e-ASIA Joint Research Forum 2011



Source: Developed by the Authors using KH Coder 3

Takashi Shiraishi, an executive member of the Council for Science and Technology Policy (CSTP), presented a keynote speech at the e-ASIA Joint Research Forum (Japan Science and Technology Agency, 2011b). One central (the keyword *problem*) and four main branches (the keywords *increasingly*, *recent_years*, *economies_of_east_asia*, and *disparity*) derive from the keynote speech using the centrality co-occurrence network of words (See around the bottom middle of Figure 3). The keyword *increasingly* is the first main branch with a Jaccard coefficient of 0.50 between the keyword *problem* and has one follower keyword, which is the keyword *coordination* with a Jaccard coefficient of 1.0 (Bottom right side from the central keyword *problem*). The first branch refers to Shiraishi mentioned the need for coordination because of the increasingly complex problems in the East Asia region.

The second main branch is the keyword *recent_years* with a Jaccard coefficient of 0.50 between the central keyword and one follower keyword, which is the keyword *other countries* with a Jaccard coefficient of 0.33 (Top right side from the central keyword *problem*). The keyword *other_countries* also has one follower, the keyword *center*, with a Jaccard coefficient of 1.0 between them. In other words, the keyword *recent_years*, as the second main branch, has the keyword *other_countries* and the keyword *center* following it. Those three keywords from the keynote speech excerpt indicate that Shiraishi noticed how other states in the Asia region were seeking to be a central part of solving the world's problems in recent years by investing and being more active in scientific research and development.

Furthermore, the last follower keyword of the second main branch has two branch keywords: the keyword *terms of science* (Bottom side from the keyword *center*) and the keyword *serve* (Top side from the keyword *center*), both with the same Jaccard coefficient of 0.33 between the keyword *center*. The first branch keyword shows how the keynote speech from Shiraishi acknowledged that other states have significant advancements in scientific activities and technological innovation, with which Japan seeks to build relationships with them and has thorough discussions on that terms. Then, the second branch keyword (*serve*) elaborates more about the first branch keyword (*terms of science*) by suggesting research and development (R&D) activities and R&D training as crucial means for Asian states to be a central part in facing, leading, and serving global development in the future.

Economies of east_asia is the third main branch keyword in the keynote speech by Shiraishi for the e-ASIA Joint Research Forum, which has a Jaccard coefficient of 0.50 between the central keyword (Bottom left side from the keyword *problem* in Figure 3). After the keyword *economies of east asia*, there is a follower keyword *economy* with a Jaccard coefficient of 0.50 between them. At first, the keyword *economies of east asia* as the third main branch and the keyword *economy* as the follower look quite the same, but both emphasize different contexts. The keyword *economies of east asia* is about Japan forecasting how big will the size of the economies of East Asia be in 2030, in which China will be five times bigger than Japan, and suggesting integration and balance for the East Asia economy. Meanwhile, the keyword *economy* is about Japan forecasting the United States and Southeast Asia will have a five times bigger economy than Japan in 2030.

The following are two excerpts from the keynote speech by Shiraishi for the e-ASIA Joint Research Forum to give a better picture of how Japan emphasizes different contexts for the economic forecast in 2030.

> "… the economy of China will be five times the size of Japan's economy in 2030, and the economy of the United States will also be nearly five times the size of Japan's. … The economies of the ASEAN countries combined will be slightly larger than that of Japan. With such dramatic changes in economic scale, there are bound to be considerable changes in the regional distribution of wealth, both regionally and globally."
> (Japan Science and Technology Agency, 2011b, pp. 3-4).

> "The other point relates to the increasingly serious problems that have arisen in East Asia in recent years, problems originating in the disparity in socioeconomic status *within and among* countries in East Asia. A major cause of this disparity is the difference in scientific and technological capabilities and human resources. These problems are a major barrier to East Asia community-building."
> (Japan Science and Technology Agency, 2011b, p. 9).

The first excerpt shows the general description of the 2030 economic forecast and how Japan perceives it, in which Japan acknowledges the considerable change in the distribution of wealth. However, the second excerpt shows the different contexts for East Asia where there is an emphasis on "within and among" in italics. The italicized phrase "within and among" was already done in the original keynote speech document. That emphasizes a deliberate differentiation for the context of the economy and economies of East Asia.

After the keyword *economy*, there are multiple branch and follower keywords, such as *require*, *promotion*, *implement*, *framework*, and *promote* (From bottom left to top left of Figure 3). In general, the branch and follower keywords show how Shiraishi thoroughly describes the Japanese government's efforts, objectives, and plans to achieve them in the keynote speech after knowing how the economy in East Asia and Asia-Pacific would turn out based on their forecast. The efforts are represented by the keyword *technology policy*, which shows the Japanese government focused on that matter a few years back. Then, the objectives appear from the keywords of *promotion*, *discussion*, *implement*, *framework*, and *promote*, which specify the Japanese government's aim for technology policy. Meanwhile, the plan unfolds from the chain of keywords around the left side of Figure 3: *section*, *Technology*, *basic plan*, *today*, *international cooperation*, *initiative*, *innovation area*, and *Science*. The chain of keywords highlights Japan has a Science and Technology Basic Plan, where one of the implementations is international cooperation.

The fourth or the last main branch keyword from the central keyword *problem* is the keyword *disparity* (Top left side from the keyword problem in Figure 3). The Jaccard coefficient of the keyword *disparity* is 1.0 between the keyword *problem*, which means a strong connection between both the central keyword and the fourth main branch keyword. The context of the fourth main branch keyword points out how, in Shiraishi's keynote speech, Japan perceives a problem of disparity within and among states in the East Asia region in the economy, human resources, scientific, and technological capabilities. Like the previous main branch keyword, the keyword *disparity* also has a chain of multiple branch and follower keywords after that, such as *achievement*, *cooperation*, *scientific*, *R&D,* and *establish* (From around the bottom middle to the top of Figure 3).

In general, the chain of multiple branch and follower keywords after the keyword *disparity* has a Jaccard coefficient between 0.33 and 1.0 between each of the keywords. From the keyword *achievement* to the keyword *scientific,* this chain part shows how Japan seeks to foster potential scientific and technology cooperation that benefits science and technology achievements in the keynote speech presented by Shiraishi. From the keyword *scientific* to *establish* (Around the top side of Figure 3), the later chain part highlights how Japan pitches the idea of e-ASIA initiatives by mentioning the keywords *creation*, *R&D*, *essential*, *establish*, and *technology_diplomacy* in Shiraishi's keynote speech to the participants of e-ASIA Joint Research Forum. One general meaning infers by picturing the whole chain from the central keyword *problem* to the last follower keyword *e_asia_intiatives* is Japan proposes e-ASIA as a solution to the problem of disparity capabilities between states in the East Asia region because of the potential to benefit science and technology achievements.

One theme can be retrieved from the centrality co-occurrence network of words in Shiraishi's keynote speech to the e-ASIA Joint Research Forum participants where the central keyword is *problem* with four main branches of *increasingly*, *recent_years*, *economies_of_east_asia*, and *disparity* to describe the condition of scientific and technological capabilities in East Asia region at that time: Japan acknowledged a need to act more for its position in the scientific and technological advancement of the East Asia region. That theme came up by considering how Japan gives so much attention to other states' growth in R&D activities and training. However, not all of the state's scientific and technological progress is directly or indirectly perceived as a problem by Japan. One considered problem is other states in the East Asia Region because there is disparity within and among them in the economy, human resources, scientific, and technological capabilities.

Based on White Paper on Science and Technology 2010, this article found Japan perceived perceived an urgency to work on two indicators of scientific contribution: the share of scientific papers and the relative citation impact in 2008. Both were surpassed by China and closely followed by South Korea. Japan had a 7% share of scientific papers, while China had a 10.5% (Ministry of Education, Culture, Sports, Science and Technology, 2011, p. 46). Then, Japan had 1.02 points and South Korea 0.77 points on the relative citation impact (Ministry of Education, Culture, Sports, Science and Technology, 2011, p. 47). That is presumably why Japan proposed e-ASIA to the foreign participants who did not represent the other states in the East Asia region. Therefore, that finding reveals characteristics of restrictive science diplomacy by showing how Japan concentrated on particular actors' scientific and technological progress and sought to hold back their progress through joint initiatives with different actors.

Conclusion and Recommendations

The recent scholarly on science diplomacy shows how several studies attempted to develop typologies of science diplomacy. Those studies sought to do that because of the need to acknowledge the cooperative and competitive aspects of international relations, which will contribute to the state of the art of science diplomacy. Following that, this article seeks to contribute to developing science diplomacy typology by borrowing the concepts of relative and absolute gains in International Relations, where the borrowing presents the typology of science diplomacy as prospective science diplomacy and restrictive science diplomacy.

This article also attempts to demonstrate the prospective and restrictive science diplomacy by applying the two types of science diplomacy in two historical cases from Japan: The Inaugural Meeting of the STS Forum in 2004 and The First Meeting of the e-ASIA Joint Research Forum in 2011. Based on the result and discussion section, the two types of science diplomacy developed in this article could fulfill their purpose of systematically describing science diplomacy into the means and ends of diplomacy while acknowledging the cooperative and competitive aspects of international relations, as shown in Table 5.

Table 5 – Findings on Japan's Prospective and Restrictive Science Diplomacy

Characteristics	Types and Cases	
	Prospective Science Diplomacy The Inaugural Meeting of the Science and Technology in Society (STS) Forum 2004	**Restrictive Science Diplomacy** The First Meeting of the East Asia Science and Innovation Area (e-ASIA) Joint Research Forum 2011
Means	1. Japan gathered fifteen foreign representatives from higher education institutions or independent scientific communities as founding members of the STS Forum. 2. Japan gathered two foreign representatives from privately-owned or state-owned enterprises as founding members of the STS Forum. 3. Japan gathered eleven foreign representatives from national governments or intergovernmental organizations as founding members of the STS Forum.	1. Japan held the e-ASIA Joint Research Forum with participation from Pacific states (Australia and New Zealand), South Asian states (India), Southeast Asian states (Cambodia, Indonesia, Laos, Singapore, Philippines, Thailand, and Vietnam), and the ASEAN Secretariat. 2. Even when the e-ASIA Joint Research Forum was entitled East Asia, there was no participation from the states in that region but Japan.
Ends	1. Japan saw indifferent gains in science and technology between its state and other actors by holding the inaugural meeting of the STS Forum because the world has a common problem to solve. 2. Japan sought to maximize individual gain in the inaugural meeting of the STS Forum by being an example for other participants and taking note of problems and technology, which bring scientists and governments together.	1. Japan forecasted other states in the East Asia Region will gain robust economic growth in 2030 because of scientific and technological advancement, which put Japan in an unfavorable position. 2. Japan sought to hold back other states in the East Asia region to attain more gains in science and technology by fostering potential cooperation with particular states in the Asia-Pacific region under one joint research program.

Source: Developed by the Authors

Despite that, this article acknowledges two noticeable limitations: the state-centric typology of science diplomacy and the small number of data for science diplomacy cases. The first limitation is not a big deal because borrowing absolute and relative gains to science diplomacy typology has three merits (exact contrasting context, clear paradigm stance, and still in use) that this article argues make it favorable, even when it is state-centric. The second limitation is significant, as this article acknowledged in the research methods section to demonstrate prospective and restrictive science diplomacy cases. This article sought to alleviate the small number of data by employing KH Coder 3 software for the analysis, which more or less made it possible to demonstrate the applicability of prospective and restrictive science diplomacy.

A simple solution exists to address the second limitation: applying the typology of prospective and restrictive science diplomacy to more cases by incorporating more data from various sources. That can make the science diplomacy typology and the general understanding of science diplomacy more robust in the future. On that note, the authors of this article invite you, the reader, to be part of the solution by sharing this article, discussing this article with your colleagues, and publishing your thoughts on prospective and restrictive science diplomacy.

Acknowledgments

We sincerely thank the anonymous referees for their substantial and helpful suggestions. We also appreciate the Intermestic staff mediating our discussion with the anonymous referees.

References

Alhammadi, A. (2022). The Neorealism and Neoliberalism Behind International Relations During Covid-19. *World Affairs, 185*(1), 147-175.

Bull, H. (1977). *The Anarchical Society: A Study of Order in World Politics.* London: Red Globe Press.

Burchill, S. (2005). *The National Interest in International Relations Theory.* New York: Palgrave.

Burchill, S. (2022). Liberalism. In R. Devetak, & J. True, *Theories of International Relations* (pp. 88-133). London: Bloomsbury Academic.

Constantinou, C. M., & Sharp, P. (2016). Theoretical Perspectives in Diplomacy. In C. M. Constantinou, P. Kerr, & P. Sharp, *The SAGE Handbook of Diplomacy* (pp. 13-27). New York: SAGE.

Davis, L. S., & Patman, R. G. (2014). *Science Diplomacy: New Day or False Dawn?* Singapore: World Scientific.

Devyatkin, P. (2022). Environmental Détente: U.S.-Russia Arctic Science Diplomacy through Political Tensions. *The Polar Journal, 12*(2), 322-342.

Echeverría-King, L. F., Toro, R. C., Figueroa, P., Galvis, L. A., González, A., Suárez, V. R., . Müller, C. N. (2022). Organized Scientific Diaspora and Its Contributions to Science Diplomacy in Emerging Economies: The Case of Latin America and the Caribbean. *Frontiers in Research Metrics and Analytics, 7,* 1-18.

Flink, T. (2020). The Sensationalist Discourse of Science Diplomacy: A Critical Reflection. *The Hague Journal of Diplomacy, 15*(2020), 359-370.

Gluckman, P. D., Turekian, V. C., Grimes, R. W., & Kishi, T. (2017). Science Diplomacy: A Pragmatic Perspective from the Inside. *Science & Diplomacy, 6*(4), 1-13.

Griffiths, M., & O'Callaghan, T. (2001). *International Relations: The Key Concepts.* New York: Routledge.

Griffiths, M., O'Callaghan, T., & Roach, S. C. (2007). *International Relations: The Key Concepts Second Edition.* New York: Routledge.

Guneratne, R. (2023). Coordinating State, Academic, and Donor Stakeholders in an International Knowledge Sharing Program: A Perspective on Science and Innovation Diplomacy. i V. Ittekkot, & J. Baweja, *Science, Technology and Innovation Diplomacy in Developing Countries: Research for Development.* (ss. 255-268). Singapore: Springer.

Higuchi, K. (2016). *KH Coder 3 Reference Manual.* Retrieved from KH Coder: https://khcoder.net/en/manual_en_v3.pdf

Japan Science and Technology Agency. (2011a). *The 1st e-ASIA Joint Research Forum.* Retrieved from e-ASIA JRP: https://www.the-easia.org/jrp/pdf/f01/WrapUpofthe1stForum.pdf

Japan Science and Technology Agency. (2011b). *Towards e-ASIA.* Retrieved from e-ASIA JRP: https://www.the-easia.org/jrp/pdf/f01/KeynoteSpeechbyProfShiraishi.pdf

Kaltofen, C., & Acuto, M. (2018). Rebalancing the Encounter between Science Diplomacy and International Relations Theory. *Global Policy, 9*(2018), 15-22.

Kauppi, M. V., & Viotti, P. R. (2020). *International Relations Theory.* Lanham: Rowman & Littlefield.

Kirshner, J. (2022). *An Unwritten Future: Realism and Uncertainty in World Politics.* Princeton: Princeton University Press.

Lamont, C. (2015). *Research Methods in International Relations.* London: SAGE.

Lundin, H., Broström, A., & Geschwind, L. (2024). Networked nexus of science diplomacy and domestic funding agency coordination: a case study of IntSam. *Science and Public Policy, 2024*(00), 1-15.

Merriam-Webster. (2023a). *Prospective*. Retrieved from Merriam-Webster: https://www.merriam-webster.com/dictionary/prospective

Merriam-Webster. (2023b). *Restrictive*. Retrieved from Merriam-Webster: https://www.merriam-webster.com/dictionary/restrictive

Ministry of Education, Culture, Sports, Science and Technology. (2011). *Chapter 1 Science and Technology Carving out a Future and Solving Challenges.* Hämtat från White Paper on Science and Technology 2010（Provisional Translation）: https://www.mext.go.jp/component/english/__icsFiles/afieldfile/2011/02/23/1302537_004.pdf

Omi, K. (2014). *Constructing a Global Science Forum.* Retrieved from Science & Diplomacy: https://www.sciencediplomacy.org/in-field/2014/constructing-global-science-forum

Rosenau, J. N. (1969). Intervention as A Scientific Concept. *Journal of Conflict Resolution, 13*(2), 149-171.

Rüffin, N., & Rüland, A. L. (2022). Between Global Collaboration and National Competition: Unraveling the Many Faces of Arctic Science Diplomacy. *Polar Record, 58*(e20), 1-12.

Ruffini, P. B. (2020). Conceptualizing Science Diplomacy in the Practitioner-Driven Literature: A Critical Review. *Humanities and Social Sciences Communications, 7*(124), 1-9.

Rüland, A. L. (2023). The Effectiveness of Science Diplomacy between Adversarial States: Insights from US–Cuban and US–Iranian Science Collaborations. *The Hague Journal of Diplomacy, 18,* 1-25.

Rüland, A. L., & Rüffin, N. (2024). A Comparison of British and German Parliamentary Discourses on Science Diplomacy Over Time. *Global Policy, 00*(2024), 1-13.

Rungius, C., & Flink, T. (2020). Romancing Science for Global Solutions: On Narratives and Interpretative Schemas of Science Diplomacy. *Humanities and Social Sciences Communications, 7*(102), 1-10.

Sørensen, G., Møller, J., & Jackson, R. H. (2022). *Introduction to International Relations: Theories and Approaches.* New York: Oxford University Press.

STS Forum. (2004a). *Inaugural Meeting Brochure.* Retrieved from Web Archive: https://web.archive.org/web/20041206070355if_/http://www.stsforum.org:80/2004_kyoto.pdf

STS Forum. (2004b). *Summary of Proceedings.* Retrieved from STS Forum: https://www.stsforum.org/file/2018/07/2004_Summary.pdf

Sunami, A., Hamachi, T., & Kitaba, S. (2013). *The Rise of Science and Technology Diplomacy in Japan.* Retrieved from Science & Diplomacy: https://www.sciencediplomacy.org/article/2013/rise-science-and-technology-diplomacy-in-japan

The Royal Society & American Association for the Advancement of Science. (2010). *New Frontiers in Science Diplomacy: Navigating the Changing Balance of Power.* London: The Royal Society.

Walker, R. B. (1993). *Inside/Outside: International Relations as Political Theory.* New York: Cambridge University Press.

Wight, C. (2006). *Agents, Structures and International Relations: Politics as Ontology*. New York: Cambridge University Press.

Yeung, E. S., & Quek, K. (2022). Relative Gains in the Shadow of a Trade War. *International Organization*, *76*(Summer), 741-65.

Organization, *76*(Summer), 741-65.

Yin, R. K. (2018). *Case Study Research and Applications: Design and Methods*. London: SAGE.

Yu, C. H., Jannasch-Pennell, A., & DiGangi, S. (2011). Compatibility between Text Mining and Qualitative Research in the Perspectiv erspectives of Gr es of Grounded Theor ounded Theory, Content Analysis, and , Content Analysis, and Reliability. *The Qualitative Report*, *16*(3), 730-744.

Zaika, Y., & Lagutina, M. (2023). Arctic Science Diplomacy in New Geopolitical Conditions: From “Soft” Power to “Hard” Dialogue? *Polar Record*, *59*(e23), -.