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Japan's Science and Technology Diplomacy: Society 5.0 and its International Projection

Abstract

Japan is the third largest economy on the planet but lacks coercive capacity due to Article 9 of its Constitution, which prevents it from having an army and declaring war. This means that it can only rely on persuasion to influence the international sphere and achieve its political objectives. One of the tools it has for this purpose is public diplomacy, which is diplomacy exercised through non-traditional means such as communication, art and culture. One branch of public diplomacy is science and technology diplomacy (S&T Diplomacy), which consists of collaboration in these areas with other nations to strengthen their international projection, as well as the dissemination of scientific knowledge and technology transfer between nations. S&T diplomacy has become a major focus for Japan of its diplomatic action since it launched the Society 5.0 project in 2016, which sought to revolutionize Japan's economy, society and governance through technology. This S&T diplomacy has the potential to not only strengthen Japan's external action, but also to transform its industries and research while it is transforming the infrastructures of Japan's partner nations, like the construction of subway and high-speed rail networks in India. This article will first analyze the theoretical framework of public diplomacy and science and technology diplomacy. Next, Japan's public diplomacy will be studied by comparing The Soft Power 30 and Global Soft Power Index. Finally, Japanese science and technology diplomacy will be analyzed by assessing the initiatives contained in the Japanese Society 5.0 project.

Keywords
Japan, science and technology diplomacy, public diplomacy, cultural diplomacy, soft power, society 5.0, international communication.

1. Introduction

In the field of international relations, the term public diplomacy has become increasingly popular in recent decades. In this sense, if traditional diplomacy is understood as the relations exercised by the official representatives of States (ambassadors, consuls, etc.), public diplomacy can be defined as any form of communicative projection carried out by a State through non-traditional methods. This would involve, for example, culture, art, sports, gastronomy and any communicative manifestation that would allow the nation's national identity to be projected abroad. One of the manifestations of this public diplomacy is technological or scientific diplomacy, which consists of the use and dissemination of science

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and technology as tools of a nation's foreign policy with the aim of improving multilateral relations with other nations, promoting the global perception of its national identity and helping to achieve foreign policy objectives.

In this sense, Japan has found in technological diplomacy a powerful foreign policy tool since the 1980s, coinciding with the so-called Japanese economic miracle. In this decade, Japan became a world reference in technology and science, and the term "Japanese technology" was interpreted by consumers around the world as synonymous with high quality. This allowed the opening of international markets to Japanese companies to the point of making Japan the world's second largest economy, behind the U.S. Likewise, Japan's commitment to scientific research (a tradition dating back to the Meiji Restoration) allowed it to position itself not only as a power in applied technology, but also as a world power in basic research. This achievement allowed the country to advance its foreign policy goals by sharing scientific advances and forming international scientific collaboration networks.

At present, Japan is in a moment of crisis in its position as a world technological benchmark. Technological production is an increasingly distributed and competitive field, and other Asian competitors, mainly South Korea and China, are competing for this leadership. In this context, the Government of Japan has diplomatically taken advantage of the celebration of the Tokyo Olympic Games in 2021 (López Aranguren, 2021c) (delayed one year due to the COVID-19 pandemic) to try to implement an ambitious plan of governmental measures to help recover the technological and scientific competitiveness of Japan (López Aranguren, 2020).

In foreign policy, Japan is also hampered by the fact that, due to the constitutional limitations set out in Article 9 of its Constitution, it has no coercive capacity in the international sphere, as it cannot have an army or declare war. This means that it can only use the tools of persuasion to achieve its foreign policy objectives. For this reason, Japan has made public diplomacy and, particularly, technological diplomacy, one of its main axes of international projection.

This has also materialized in the establishment of technological diplomacy as one of the most important vectors of its Free and Open Indo-Pacific (FOIP) initiative, Japan's vision for an area that could be the new global axis of the planet (Ministry of Foreign Affairs of Japan, 2022) and which has also motivated the creation of strategic plans by the main political actors on the planet, such as the United States and the European Union (López Aranguren, 2022a, 2022b). This has included such ambitious projects as the construction of the metro system in several Indian cities such as Delhi and Mumbai, as well as the bullet train project in the same country between the cities of Mumbai and Ahmedabad in collaboration with European partners. Both projects have received financial participation from the Japan International Cooperation Agency (JICA).

Likewise, the *Society 5.0* project that the Japanese government has launched to modernize the Japanese economy, politics and society devotes special attention to technological diplomacy, considering it not only a lever to boost Japan's external projection, but also a channel to achieve these objectives at home through international collaboration and the internationalization of Japanese science and technology.

This article will first examine the theoretical foundations of public diplomacy and science and technology diplomacy. Then, it will analyze Japan's public diplomacy using data from The Soft Power 30 and Global Soft Power Index. Finally, it will evaluate Japan's science and technology diplomacy initiatives within the context of the Japanese Society 5.0 project.

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2. Theoretical framework and conceptual approach to Japanese technological diplomacy

There are several terms that are sometimes used interchangeably to refer to the non-traditional diplomacy of States, but which, however, contain different nuances that should be differentiated. These terms include public diplomacy, cultural diplomacy and soft power.

The most widespread term is public diplomacy, which was coined by the diplomat and dean of the Fletcher School of Law and Diplomacy, Edmund Gullion in 1965, although the concept has been around forever (Tuch, 1990). This coining came at a historic moment in international relations. In 1962 the Cuban missile crisis had erupted, which brought the world to the brink of a direct nuclear conflict between the US and the USSR. It is possible to interpret this conceptual development as an attempt to create alternative tools to traditional diplomacy by which nations could achieve their political objectives without limiting themselves to traditional diplomacy, which proved ineffective in avoiding this nuclear escalation.

Traditionally, the term used to refer to the communicative projections of a political power abroad is called "propaganda" and, in fact, Gullion preferred this term. However, this term acquired so many negative connotations that it was eventually replaced by "public diplomacy" (Cull, 2008).

The Japanese government's interpretation of the concept of public diplomacy can be found on the website of its Ministry of Foreign Affairs of Japan (MOFA, 2022). In it, MOFA itself refers to public diplomacy by announcing that:

> The Ministry of Foreign Affairs of Japan (MOFA) actively communicates a variety of information on Japanese foreign policy as well as general information on Japan for better understanding of Japan worldwide. MOFA also assists activities to introduce Japanese culture, to encourage people-to-people exchange and to promote Japanese language education, engaging with policy makers, opinion leaders, related experts and local people.

Regarding cultural diplomacy, we can find a definition of it by the Institute for Cultural Diplomacy (ICD, 2021): "a course of actions, which [...] utilize the exchange of ideas, values, traditions and other aspects of culture or identity, whether to strengthen relationships, enhance socio-cultural cooperation, promote national interests and beyond."

Thus, cultural diplomacy would be a sub-branch of public diplomacy, the former encompassing all the cultural and artistic manifestations of a nation (literature, cinema, gastronomy, architecture, painting, language, etc.), while the latter would encompass both cultural diplomacy and other manifestations of the nation that are not strictly cultural (such as the natural heritage of that nation).

These open definitions allow public diplomacy in Japan and other nations to be exercised by the public sector, the private sector or civil society, since it is not limited to a single governmental actor. This allows the articulation of public diplomacy in a nation like Japan to involve different state institutions, the government, companies, social and religious leaders, and creators of cultural content among others. All of them would participate in Japan's communicative dimension, projecting Japan's national identity on the international stage in a multifaceted way. In this sense, Japan is a world cultural power in terms of the audiovisual and comic industry due to its strong national anime and manga industry. These means of expression offer great communicative opportunities for Japanese public diplomacy. In this regard, academic literature has already highlighted the political influence that audiovisual entertainment can achieve (Delli Carpini, 2014).

This plurality of communication actors that would participate in Japan's public diplomacy is ensured by the fact that Japan is a democracy where Article 21 of the Japanese Constitution guarantees freedom of expression as follows: "Freedom of assembly and association as well as speech, press and all other forms of expression are guaranteed. No censorship shall be maintained, nor shall the secrecy of any means of communication be

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violated" (Prime Minister of Japan and His Cabinet, 1946). This allows any sub–state actor (whether individual or collective such as a company or association) to participate in Japan's communication projection abroad. This dynamic between Japan's freedom of expression and its constitutional protection has been analyzed using the theoretical framework of rational choice theory. This has made it possible to conceive it as a mechanism that guarantees the rationality of Japanese society when making political decisions (López Aranguren, 2017a).

Technological diplomacy would definitely correspond to a nation's public diplomacy. However, to the question of whether technological diplomacy would be part of the nation's cultural diplomacy, the answer would depend on whether this technological and scientific transfer allows the incorporation of a cultural dimension (for example, by associating science and technology to the design of technological products, to its educational system, to its values or to other cultural manifestations of the nation).

Similarly, the concept of *soft power* is different from that of public diplomacy. This term was coined by Joseph S. Nye and defined as "the ability of a nation to shape the preferences of other nation through diplomacy and attraction." (Nye, 2005).

We can see that this term, although related to that of public diplomacy, the concept of soft power would be more focused on influencing other international political actors to modify their behavior through persuasion. In the case of Japan, its public diplomacy would be constituted by all the communicative and cultural projection actions carried out by Japanese communicative actors. Japan's soft power, on the other hand, would encompass both its public diplomacy and traditional diplomacy to attract other nations to a given hierarchy of preferences.

This concept of soft power contrasts with the other aspect of power: *hard power,* which Nye defines as the ability of a nation to generate in other nations a desired course of action using military and economic means. Both powers would be combined in what Nye called *smart power*, which would be the intelligent use that a nation makes of its hard and soft power capabilities. In other words, knowing how to use the tools of coercion and persuasion appropriately. Although the term *smart power* has been used on previous occasions by different authors with different interpretations, this article will use Nye's taxonomy.

Having established these conceptual differences in terms of the generic terms commonly used in connection with a nation's public diplomacy, the next step would be to differentiate the different variants of specific terms that may cause confusion with technology diplomacy. The most popular is *Science & Technology Diplomacy* (*S&TD*). This term is the most popular and includes both the transfer of technology applications and the collaboration and transfer of fundamental research projects, and is the most commonly used in Japan. Another term used is *Science, Technology & Innovation Diplomacy*, which would include the above dimensions with the addition of process, product and service improvement. Finally, another term that has begun to become popular is *Techplomacy*, mixing the terms *technology* and *diplomacy*. This term is used, for the moment, in political marketing and does not have the weight in the academic literature or in the political discourse of the previous terms.

3. Japan's public diplomacy

Japan is a particular case with respect to the powers it can use at the international level: not being able to have an army as such by its own Constitution and having renounced its right to war, its tools to act internationally would be limited (Tirado, 2019). This limitation to its international coercive capacity is contained in Article 9 of its Constitution, which states that (Prime Minister of Japan and His Cabinet, 1946):

> Aspiring sincerely to an international peace based on justice and order, the Japanese people forever renounce war as a sovereign right of the nation and the threat or use of force as means of settling international disputes. In order to accomplish the aim of the preceding paragraph, land, sea, and air forces, as well

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as other war potential, will never be maintained. The right of belligerency of the state will not be recognized.

This means that Japan does not have an army as such, but the Self-Defense Forces (*Jietai*), for which it has announced an increase in the defense budget to 2% of its GDP by 2027 (Kavanagh, 2023). According to Nye's categorization previously studied, Japan would have only soft power and the economic part of hard power. This has made, for Japan, the acquisition and processing of information and intelligence related to its national security of paramount importance, which has led to the modernization of its intelligence services (López Aranguren, 2016) and repeated attempts to create a robust military intelligence exchange with potentially allied nations such as South Korea (López Aranguren, 2017b).

This constitutional limitation has also meant that Japan has had to rely particularly heavily on its public diplomacy to achieve its foreign policy objectives. This Japanese commitment to the tools of soft power and public diplomacy has been reflected in the various indices or indicators that use quantitative methodologies to study the capacity of different nations in these dimensions.

Thus, there are two popularized indexes that measure (according to their own metrics) the public diplomacy of leading nations in this dimension. The first is The Soft Power 30 Index (2019) (prepared by Portland, Facebook and the USC Center for Public Diplomacy). The second is the Global Soft Power Index, published by the consultancy Brand Finance (Brand Finance, 2021).

The first index, The Soft Power 30 analyzes each year the major powers in terms of soft power and assigns them a score determined on the basis of several summative dimensions (Portland, 2019). The latest edition available at the time of publication of this article is the 2019 edition, before the pandemic. In it, Japan ranks eighth in the world scoring 75.71 points out of 100, behind France, the United Kingdom, Germany, Sweden, the United States, Switzerland, and Canada. France, the leading power in this indicator, would score 80.28 soft power points.

Table 1: The Soft Power 30 Index.

The Soft Power 30 Index		
Position	**Country**	**Score**
1	France	80.28
2	United Kingdom	79.47
3	Germany	78.62
4	Sweden	77.41
5	United States	77.40
6	Switzerland	77.04
7	Canada	75.89
8	Japan	75.71
9	Australia	73.16

Source: The Soft Power 30.

The Soft Power 30 is also composed of seven variables or sub-indexes corresponding to different dimensions or fields involved in a nation's soft power or public diplomacy, with a score assigned to each. These are: the digital dimension (where Japan scores 7 points), enterprise (7), education (16), culture (6), engagement (5), government (16) and polling (7). The first six variables are extracted from different objective indices of the nation and have a weight in the final score of 65%. The last variable, polls, analyzes the global audience's perception of Japan's nation brand (and that of the other participants in the study) and has a weight of 35%. This dimension of polls is made up of seven categories: gastronomy, technological products, friendliness, cultural, luxury goods, foreign policy and quality of life. These surveys were carried out, in the latest edition, on a sample of 12,500 people from 25 countries around the

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world with a wide representativeness. In this regard, the report emphasizes Japan's strengths in soft power, highlighting that an improvement can be perceived in the Culture sub-index by improving eight positions to sixth place. The report values the opportunity presented by the celebration of international events, such as the 2021 Olympic Games, the 2019 Rugby World Cup and the holding of the G20 Summit, highlighting the effectiveness of sports diplomacy as a tool for international projection (The Soft Power 30, 2019).

Table 2: The Soft Power 30. Japan's sub-indexes.

The Soft Power 30. Japan's sub-indexes	
Variable	**Score**
Digital	7
Enterprise	7
Education	16
Culture	6
Engagement	5
Government	16
Polling	7

Source: The Soft Power 30.

While analyzing Japan's strengths in this dimension of soft power, it also provides recommendations for improving these indicators, taking advantage of the new Reiwa era ("beautiful harmony") as a catalyst for this period of domestic and international transformation, a moment that joins the celebration of the Tokyo Olympics in 2021 (delayed one year due to the COVID-19 pandemic). In this regard, it is noted that Japan has positioned itself as a leading country in the Culture and Engagement sub-indices. However, it considers that there is more room for improvement in the Governance and Education sub-indices. Finally, the index recommends carefully managing the relationship between domestic political considerations and the data received about the global perception of Japan to maximize its global projection (The Soft Power 30, 2019).

According to this indicator, Japan would have dropped slightly in absolute terms from 2018 (76.22 points), but three positions from the fifth position in that year. This would indicate that this decline in the ranking is due more to an improvement in the soft power of the other competitors than to a problem for Japan. Taking into account all historical data available since 2015, Japan would have increased its overall score from that first year in which this record is made by scoring 66.86 points that year.

Meanwhile, according to the second index analyzed, the Global Soft Power Index, Japan would be the second world power in soft power in 2021 with a score of 60.62, only behind Germany (62.2 points) (Brand Finance, 2021).

In this indicator, Japan would have advanced two positions globally, from fourth to second, since 2020. The variables captured in this indicator are: familiarity (7.57 points in seventh position globally), influence (5.66 in sixth position), reputation (7.34 in fourth position), business and trade (7.01 points in first position), governance (5.36 in sixth position), international relations (5.77 in seventh), culture and legacy (5.26 in sixth), media and communication (4.11 in tenth), education and science (7.51 in first), people and values (4.51 in twelfth), response to COVID-19 (5.82 in second position worldwide) and network of influence (achieving 54.7% in sixth position). The impact of the pandemic on political communication has been intense: studies have been carried out comparing the Japanese communicative response against COVID-19 with that of other European countries (López Aranguren, 2021b), as well as the importance of the so-called vaccine diplomacy in times of COVID-19 (Manfredi-Sánchez, 2022) or the impact that this pandemic has had on presidential digital

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communications (Manfredi-Sánchez, Amado-Suárez & Waisbord, 2021). As can be seen, this indicator improves Japan's position as a public diplomacy power or soft power (assuming that both terms are synonymous) with respect to The Soft Power 30 index.

Table 3: The Global Soft Power Index 2021: Japan.

The Global Soft Power Index: Japan			
Variables	**2021 Score**	**Position**	**2020 Score**
Global Soft Power Index	60.62	2	60.24
1. Familiarity	7.57	7	7.67
2. Reputation	7.34	4	7.53
3. Influence	5.66	6	5.86
3.1 Business & Trade	7.01	1	6.91
3.2 Governance	5.36	6	5.43
3.3 International Relations	5.77	7	5.17
3.4 Culture & Heritage	5.26	6	5.75
3.5 Media & Communication	4.11	10	4.19
3.6 Education & Science	7.51	1	6.52
3.7 People & Values	4.51	12	4.77
3.8 COVID-19 Response	5.82	2	5.82
4. Network Influence	54.7%	6	43.6%

Source: The Global Soft Power Index 2021.

4. Japan's Science and Technology Diplomacy

Japan made an explicit commitment to science and technology diplomacy with the publication of the report *Toward the Reinforcement of Science and Technology Diplomacy* by the Council for Science and Technology Policy (CSTP) (2008, pp. 7–8). This report sets out the four priorities that Japan's science and technology diplomacy should pursue: first, to launch mutually beneficial projects with other nations. Second, generate synergies between science and technology actors and diplomats to solve global challenges facing humanity. Third, develop the human resources needed to develop S&T diplomacy. Fourth and finally, to increase Japan's international presence.

Both this report and other researchers specializing in the field of Japan's science and technology diplomacy have identified risks to this national goal, differentiating between external and internal challenges. Among the external challenges, they have identified that, despite the awareness in Japan's diplomatic community of the importance of technology diplomacy, the rapid growth of other Asian nations in their scientific and technological development poses stiff competition for Japan (Sunami *et al.*, 2013):

> The idea of science and technology diplomacy gradually spread among the S&T and diplomatic communities in Japan. At the same time, however, as the "catching up" nations rapidly increased their presence, it became difficult for Japan to maintain a leading position in the field of S&T. For example, China and South Korea's share of research papers in twenty-two S&T fields cited in Thomson Reuters' Web of Science has been increasing since around 2000, while that of Japan has been declining over the same period. The growth of Chinese and South Korean articles in the share of the top 10 percent of research papers in these twenty-two fields is also remarkable. Furthermore, in recent years, Japan has been facing the stagnation of R&D expenditures both in government and in the private sector.

Among the internal or domestic challenges, these authors have identified that the progressive reduction and aging of the population will reduce the number of researchers and personnel specialized in technological development and this may reduce the nation's scientific and technological production. The solution to this situation was to promote technological

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diplomacy by focusing it not only as a unidirectional projection of Japan to the outside world, but in an inclusive way, creating international cooperation networks. To this end, this cooperation was divided into three areas: a) technological and scientific cooperation with developing countries to combat global challenges and help these countries to develop; b) cooperation in research in cutting-edge technologies with developed countries; and c) research cooperation with East Asian countries within the East Asia Science & Innovation Area program.

The Japan Science and Technology Agency described this East Asia Science & Innovation Area program as an initiative aimed at intensifying the exchange of science and technology to strengthen research and development in this region. It also sought to strengthen economic development, human resource development and cooperation among the nations of this area in the face of collective challenges such as natural disasters, protection and the fight against infectious diseases. To this end, research initiatives implemented among 3 or more members of this region would be supported (Japan Science and Technology Agency, 2012). These researchers described this development as follows:

> The aim of science and technology diplomacy was not only to meet diplomatic needs. The other trigger was the need to open up Japan's science community to the world and end the inward-looking propensity of Japanese researchers. The CSTP working group report was unique in that it encouraged S&T cooperation with developing countries as well as developed countries. Cooperating with developing countries is helpful to solving global issues, but at the same time the working group considered that it is also valuable to the revitalization of Japan's science community. The working group thought that foreign researchers in dynamic nations could stimulate Japanese researchers and be a positive influence on Japan's R&D system as it was in the era of catching up during the last century.

These CSTP recommendations came to fruition in the August 19, 2011 publication of the *4th Science and Technology Basic Plan*, which established Japan's science and technology diplomacy as a national priority. This Fourth Plan had a major focus on mitigating the impact of the March 2011 tsunami that impacted the Tōhoku region and the subsequent Fukushima nuclear plant accident, (Council for Science, Technology and Innovation, Cabinet Office, 2011).

In this five-year implementation plan, under the heading *Strategic development of international activities*, the main actions to be carried out under this initiative of Japan's science and technology diplomacy are detailed (Council for Science, Technology and Innovation, Cabinet Office, 2011). These initiatives consist of the promotion of research & development to solve challenges in Asia (through the *East Asian Science and Innovation Area Initiative*) and the development of Science & Technology diplomacy.

This first official recognition of Japan's science and technology diplomacy evolved into a more ambitious plan with the approval by the Cabinet Office of the Prime Minister of the Japanese Government on January 22, 2016 of the *5th Science and Technology Basic Plan* for fiscal years 2016 to 2021, (Council for Science, Technology and Innovation, Cabinet Office, 2016). It popularized the concept of Society 5.0, which was defined as a human-centered, balanced, and social problem-solving society integrating the physical and cyber dimensions. This Society 5.0 would be the last stage of a social evolution that would have started in the society of farmers and gatherers (Society 1.0), continued in the agricultural society (Society 2.0), evolved into the industrial society (Society 3.0) and transformed into a society of transformation (Society 4.0), (Council for Science, Technology and Innovation, Cabinet Office, 2016).

The importance of technology diplomacy was growing for the Japanese government. The *Advisory Panel on Science and Technology Diplomacy* was formed to advise the Japanese Government in this field and, following its recommendations (Ministry of Foreign Affairs, 2015) in September 2015, Japanese Foreign Minister Fumio Kishida appointed University of Tokyo Professor Teruo Kishi as the first science and technology diplomacy advisor to MOFA (Ministry of Foreign Affairs of Japan).

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This *Advisory Panel on Science and Technology Diplomacy* has made as many as fifteen recommendations to the Japanese government on science and technology diplomacy divided into five sections. A translation of each of these recommendations, as well as an analysis of them, will be provided below (Ministry of Foreign Affairs, 2015).

4.1. *Responding to global challenges and seizing diplomatic opportunities*

Recommendation 1: Establish a position to 'take the lead in solving global challenges by using science, technology and innovation to achieve desirable international circumstances' (clearly position science and technology diplomacy (STD) as the new focus of Japanese diplomacy).

In this recommendation, the initial importance given to science and technology diplomacy can be seen by establishing it as the new general axis of Japanese diplomatic strategy. Implementations of this recommendation can be seen in the dissemination of technology to different countries close to Japan from the Free and Open Indo-Pacific (FOIP) initiative (Thankachan, 2017). Also, the goal of positioning Japan as a leading country in solving these global challenges can bring political benefits in many areas other than purely technological.

Recommendation 2: Build a mechanism to quickly identify the "next challenges" of the international community that will be important in the future and for which Japan can easily exercise leadership.

Following on from the previous recommendation, this recommendation would seek to define what the future challenges of the international community will be. This would allow Japan to gain a competitive advantage in complying with Recommendation 1, allowing it to play a normative role in defining future global challenges, contributing to its own national vision. In this regard, given that Japan is a nation without large hydrocarbon reserves, it would be in its interest to include energy transition as one of the global challenges.

Recommendation 3: In light of the problems identified, establish a diplomatic agenda based on scientific evidence and lead international efforts.

This implies subordinating the entire diplomatic initiative to this overarching goal of positioning itself as a leading nation in science and technology diplomacy. This is a logical strategy since Japan cannot employ the military dimension of its hard power. Instead, science and technology diplomacy can participate in both the hard and the soft power, since it has an economic dimension and a communicative dimension.

4.2. *Strengthening cooperation with diplomatically important partners and emerging states*

Recommendation 4: Promote strategic joint research and development with partner countries with high diplomatic importance.

The effect of this recommendation can be measured by the Collaboration Index, which is an index that measures the number of scientific publications in which researchers from two countries participate (Nature Index, 2022). In the case of Japan, the cultural particularities of Japan may force international Social Science research conducted on that country to require methodological adaptation (López Aranguren, 2019), which may have its impact on the number of international scientific collaborations launched each year. In 2019 (the last year before the COVID-19 pandemic), Japan's top partner was the USA, with a score of 1015.75 (rising from 945 in 2017). Second was China with 548.68, climbing from third place in 2017 when it scored 321 points (a 70% increase). This intense collaboration may come as a surprise given that, in many fields such as security, China can be considered a strategic rival of Japan. The clearest example of this friction between the two powers would be the one related to the conflict around the Senkaku Islands (López Aranguren, 2018).

However, it is also true that both nations have intense trade relations that in 2021 made China Japan's largest trading partner, surpassing the US and consuming up to 20% of Japanese

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exports (Nikkei Asia, 2021). This could explain why at the business and patent level the scientific and technological collaboration between these two nations is so intense.

Japan's third-ranked scientific partner is Germany, with a score of 343.91, followed by the United Kingdom (222.71), France (197.17), South Korea (134.75) and Australia (113.28).

Recommendation 5: Along with promoting overseas activities of Japanese companies, proactively support the improvement of capacity to make policies in science, technology and innovation, and the development of innovative human resources, in newly emerging economies, as well as the development of their human resources.

Science and technology diplomacy, as can be seen, may also have among its objectives the improvement of the competitiveness of the national and international workforce. Due to the growing importance of the cloud computing, the international collaboration of multinational employees and e-working, part of this innovative and technological development may force the adequacy of legislation when sharing data between Japanese and foreign electronic servers (Gascón, 2021).

Recommendation 6: Strengthen cooperation with emerging and developing countries through triangular cooperation agreements or through the Science and Technology Research Partnership for Sustainable Development (SATREPS), making progress in the creation of strategic alliances and projects with emphasis on innovation in emerging economies.

The special attention paid to the establishment of scientific cooperation relations with emerging countries shows that Japan's commitment is long-term: emerging nations are those that, according to demographic forecasts, will enjoy a privileged position in the near future, so Japan would find itself in a favorable position as a preferred technological partner of these nations. This collaboration may contribute to promoting these nations' scientific capabilities, while at the same time reaching multilateral solutions to global challenges such as climate change or energy transition.

Recommendation 7: Strengthen cooperation for human resource development (assistance to engineering universities, etc.) and proceed with the creation of next-generation networks.

This commitment to emerging countries is not limited to institutional or policy-level collaboration, but seeks to establish direct personal connections with the students who will form the nation's future generation of researchers. This recommendation can be connected to recommendation number 13 of incorporating scientific and academic personnel into the formulation of diplomatic policies, so that the connection and collaboration between these agents in Japan is also made personally with their counterparts in the country receiving these projects.

Recommendation 8: Utilize human resources personnel in science and technology in diplomatic activities through exchanges with the private sector.

This strategy seeks to symbiotically integrate Japan's political, business and scientific dimensions to achieve the maximum impact of Japan's science and technology diplomacy.

4.3. *Strengthening the use of scientific knowledge in the formulation and implementation of diplomatic policy*

Recommendation 9: Appoint a scientific and technological advisor to the Minister of Foreign Affairs on a trial basis.

As described, this was fulfilled with the appointment of Professor Teruo Kishi as an advisor to the Government of Japan. This initiative may strengthen Japan's sub-index in Governance analyzed by The Soft Power 30 by creating an official position that can reinforce the government's view of the importance of science and technology, both domestically and internationally.

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Recommendation 10: Build networks within and outside the country to strengthen coordination with ministries, organizations, academic experts and the industrial community, and formulate a structure to assist the science and technology advisor.

This initiative would be an extension of Recommendation 8: Collaborations between policy-makers, researchers and entrepreneurs should have a formal support structure. The engagement of these institutions with such varied global audiences could be approached from the perspective of brand activism, a technique to align citizen-audiences with political interests, collaborating, also, with economic actors (Manfredi-Sánchez, 2019).

Recommendation 11: Strengthen the capacity and number of staff at diplomatic missions abroad in charge of science and technology (including strengthening information exchange and coordination with headquarters and other missions, and improving training opportunities).

Embassies, consulates and other diplomatic missions can progressively provide themselves with personnel specialized in science and technology to implement this diplomatic strategy. This initiative would be the projection at the "micro" level of recommendation 9 to appoint a science and technology advisor. Japan's diplomatic and consular network would thus have professional advisors in these areas to help implement these initiatives at the specific level in each of the nations where they are stationed.

4.4. *To develop human resources to support science and technology diplomacy*

Recommendation 12: Involve young and mid-career researchers in the formulation of diplomatic policy (working in the Ministry of Foreign Affairs, assisting the science and technology advisor, and sending them to international organizations).

This would be a further concretization of the previous recommendations related to the policy-science-business symbiosis strategy. Encouraging interdisciplinarity between these three dimensions would be particularly helpful to these political objectives. Many of the projects need a business vision provided by the economic actors and a technical part provided by the scientific actors.

4.5. *Strengthening of networks and dissemination of information*

Recommendation 13: Proactively convey the message that Japan will take the lead in solving global problems by using science, technology and innovation to achieve desirable international circumstances to the international community at a high level, including the Prime Minister and Foreign Minister.

It is noteworthy that great importance is given to the communication dimension of all these scientific and technological initiatives. In this regard, Prime Minister Fumio Kishida visited Vietnam on April 30, 2022 where, among other agreements, he highlighted the scientific and technological exchange with this nation in the areas of health, renewable energies and hydrocarbon exploration within the framework of the FOIP initiative (Pankah, 2022).

Recommendation 14: Strategically target influential science and technology-related organizations while promoting intellectual exchange, and strengthening the network.

In the same way that Japan is committed to multilateralism and the strengthening of global and regional institutions in diplomacy, it would apply the same approach to technology diplomacy, including in its strategy the participation in organizations dedicated to these disciplines.

Recommendation 15: Strengthen the dissemination of Japan's scientific and technological information abroad, send scientists and seek coordination with [scientific] exhibition platforms at home and abroad (Japan House, for example).

Japan House is an initiative of MOFA "as an overseas base to deepen understanding and expand empathy for Japan by expressing and spreading its diverse attractions. [...] The goal is to establish in major cities a platform where people with passion and talent to express about Japan have a 'foothold' that inspires them to think 'I want to/I can express something there'" (Japan House, 2022). As of April 2022, there are three Japan House locations: London, Los Angeles and Sao Paulo.

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All these recommendations and initiatives have evolved into the *6ᵗʰ Science and Technology Basic Plan* (Council for Science, Technology and Innovation, 2021) published on March 26, 2021. This new plan deepens the vision contained in the *Society 5.0* concept while introducing new objectives, such as combating the effects of COVID-19. It also reinforces the notion of science and technology diplomacy in the international projection of Japan by stating that "We will put Society 5.0 to the forefront as a universal and global image of our future society in order to achieve what the Constitution of Japan declares, 'we desire to occupy an honored place in an international society.' This is the central message of the Sixth Basic Plan" (Council for Science, Technology and Innovation, 2021, pp. 3-4). And more specifically, it is announced that (Council for Science, Technology and Innovation, 2021, p. 46):

> The government will develop science and technology diplomacy, including the strategic construction of an international network between Japan and countries and regions that share common issues and values, while taking into account international responsibilities and overall security. Through this, the government will disseminate Society 5.0 to the world, while incorporating and developing the world's knowledge and diversity, and maintain and strengthen the common understanding and international competitiveness of Japan. The government will continue to produce researchers from Japan who can play a central role in international research activities, etc. its presence as an advanced nation in science and technology in research communities at home and abroad, attract excellent human resources with diverse backgrounds at home and abroad, and support the autonomous securing of the soundness and fairness (research integrity) of research in harmony with foreign countries.

Japan, within its Free and Open Indo-Pacific initiative, has already begun to implement this vision through science and technology diplomacy actions to nations in the region. One of the clearest examples is the construction of metro systems in numerous Indian cities such as Delhi, Mumbai and Chennai by Japanese and French companies. In a city like Delhi, with more than 30 million people and a serious traffic and pollution problem, the creation of metro networks has become an urgent necessity not only for employment and transportation, but also for public health. From a diplomatic point of view, this collaboration was highlighted by Japan's Ambassador to India, Kenji Hiramatsu, as a first step of future Japanese infrastructure development projects in India (Business Standard, 2018).

Similarly, Japan will take charge of the construction of several bullet train routes in India, the first being the 500 km Mumbai-Ahmedabad high-speed corridor. This line will feature Japanese Shinkansen E5 trains travelling at around 350 km/hour following the agreement Singh and Abe signed in 2013 for a study on transport and infrastructure solutions, which was covered on a 50/50 basis between Japan and India. This initial project was implemented by the Japan International Cooperation Agency (JICA) and the Société Nationale des Chemins de Fer Français (SNCF), increasing the international weight in the search for solutions to Indian development by its government (López Aranguren, 2021a). The total cost of the project is 15 billion dollars, 81% of which will be financed by the Japan International Cooperation Agency (JICA) through a loan under very advantageous conditions and with a symbolic interest rate. As these examples illustrate, Japan's technological and scientific diplomacy plays a key role in articulating the FOIP vision for the entire region.

5. Conclusions

For Japan, public diplomacy is a vital tool in its international projection due to the fact that, under Article 9 of its Constitution, it can neither have an army nor declare war, leaving it without external coercive capacity. Therefore, Japan has given special importance to public diplomacy in order to achieve through persuasion alone what other countries achieve through a combination of force and persuasion.

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As part of this firm commitment to public diplomacy, Japan has been increasing the importance it has been giving to science and technology diplomacy until announcing that it is making it one of the main axes of its diplomatic strategy. This path began with *The 4th Science and Technology Basic Plan*, announced in 2011, in which the first official reference to science and technology diplomacy appeared at a historic moment when the country was trying to recover from the 2011 tsunami and the subsequent Fukushima accident.

The next five-year plan, *The 5th Science and Technology Basic Plan*, announced in 2016, published the concept of *Society 5.0* that would inspire all government policies seeking to respond to the social, technological and economic challenges of the new century. Likewise, this plan also detailed in great detail all the activities in which this technological diplomacy was to take shape, offering up to fifteen recommendations in five vital areas (assuming a leadership position in the face of global challenges, strengthening cooperation with international partners, strengthening the role of science in Japanese diplomacy, developing human resources for science and technology diplomacy, and strengthening the dissemination and awareness of these activities). *The 6th Science and Technology Basic Plan*, published in 2021, continues this plan to strengthen Japan's science and technology diplomacy by also introducing the fight against the impact of COVID-19 on society as a further manifestation of the *Society 5.0* concept that has people at the center of political action.

The implementation of these strategies resulted in Japan managing to increase its international scientific collaborations in 2019, something reflected in the *Collaboration Index* where Japan's main scientific partner was the USA, followed by China, Germany, UK, France and South Korea. It also resulted in agreements that have allowed the construction of the metro systems of several Indian cities such as Delhi and Mumbai by Japanese companies within the framework of the Free and Open Indo-Pacific (FOIP), as well as the construction of the bullet train project between Mumbai and Ahmedabad. Japanese technology diplomacy thus becomes a fundamental instrument for articulating Japan's FOIP vision for the region, transforming not only Japan's diplomatic position on the international stage, but also the very infrastructures and competitive capacity of Japan's partner nations. In this way, this tool of public diplomacy can project its transformative capacity beyond the nation that executes it, helping the progress also of the nations that are recipients of it, such as India in this case.

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