Science and Technology Trends
Science Diplomacy

Synergistic Cooperation of Science and Diplomacy: Case Study of Science and Technology Diplomacy of Japan†

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1. Introduction

Considering the recent debates and activities in science and diplomacy, it seems appropriate to call the present situation as science diplomacy renaissance, i.e., a revival of science in the diplomatic field. Similar to other countries, even though science and technology had been used as tools for foreign diplomacy, Japan did not put an extra focus on its soft power before the renaissance.

Nonetheless, the Japanese government took notice of science diplomacy and put an emphasis on its concept relatively early. Just a few months after Lord and Turekian (2007) presented the article "Time for a New Era of Science Diplomacy" in *Science* magazine, the executive members of the Council for Science and Technology Policy (CSTP) of Japan issued a paper titled "Toward the Reinforcement of Science and Technology Diplomacy" in April 2007 (Aizawa, et al., 2007). Consequently, they immediately launched a working group on science diplomacy, which is usually referred to as "science and technology diplomacy" in Japan, and started the discussion.

Here, one question arises. Even though it was not yet an international trend at that time, what then attracted them to science diplomacy? There should be some specific reasons for Japan to promote science diplomacy. One simple answer for this is that Japan was standing on the verge of the 34th G8 Summit (and also the G8 Science and Technology Ministers' Meeting) and the Tokyo International Conference on African Development (TICAD) IV, both to be hosted by Japan in 2008. They intended to provide a new agenda for these head-of-state level meetings from the science and technology side. Other reasons shall hereinafter be discussed in this article.

This article first introduces traditional international scientific activities of Japan, and then discusses the structure of science diplomacy.

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2. Background: International Activities Predating the Term Science Diplomacy

2.1 Traditional International Science and Technology Activities of Japan

2.1.1 International Activities of the Science Council of Japan

In academia, the Science Council of Japan (SCJ) is the authority that represents Japanese scientists within and outside Japan (Article 2, Act on the Science Council of Japan), and has been practicing international cooperation from the early period after World War II.

In October 1961, SCJ released a statement on international scientific cooperation. In the statement, SCJ shows five principles of international scientific cooperation: (1) International scientific cooperation should aim for contribution to peace; (2) International scientific cooperation should be worldwide; (3) Independency should be respected in international scientific cooperation; (4) International scientific cooperation should be conducted among scientists equally; and (5) The results of international scientific cooperation should be disclosed to the public.

Based on these principles, SCJ promoted international cooperation even between the countries that have no diplomatic relations with Japan, which nowadays we could call Track II diplomacy. However, the purpose of these activities was purely in the promotion of science. Whenever there lay diplomatic barriers, SCJ requested the Japanese government for the diplomatic assistance, which we nowadays call Diplomacy for Science. In December 1961, SCJ requested the government to implement measures that allow academic exchange between the countries without diplomatic relations between Japan at the time, namely, East Germany, China, South Vietnam, and North Korea. Moreover, in 1965, SCJ launched a complaint against the government for the incident that the government refused entry to the delegation from North Korea to the International Electrotechnical Commission (IEC) held in Tokyo. Thus, there seemingly underlies the idea of academic freedom from politics. That is to say, the academia did not have any intention through its activities to undertake Track II diplomacy to alter the diplomatic situation.

2.1.2 International Affairs Discussed in Science and Technology Administration

The measures related to international affairs had been discussed by the Science and Technology Agency (STA) and the panel on international issues in the Council for Science and Technology (CST). The happenings after the CST was reorganized into the Council for Science and Technology Policy (CSTP) in the Cabinet Office will be described later.

The Ministry of Education, Culture, Sports, Science and Technology (MEXT), which succeeded sectorial councils except for the CST from STA, merged six councils into a new Council for Science and Technology in 2001. International issues for science and technology promotion were discussed in the international committee of the council.

2.1.3 Science and Technology for Japanese Diplomacy

The 1969 version of the diplomatic bluebook was the first version of the series with the section titled “International Cooperation in Science and Technology” (MOFA, 1969). The subsections were as follows: (1) peaceful use of atomic energy, (2) international cooperation in peaceful use of space, (3) international cooperation in peaceful use of seabed, and (4) the Antarctic Treaty Consultative Meeting (ATCM). (Related contents on these topics had already been included in other sections separately in the previous versions.) It is seen that these subtopics mostly target the frontier areas, where international legal frameworks were inadequate so that diplomatic conflicts could

happen. Their main concerns were on the diplomatic coordination for science activities in such areas, or the use of scientific knowledge in these areas.

Another occasion where science and technology are seen in diplomacy, is Official Development Assistance (ODA). Although ODA mainly consists of technical assistance that can be applied in basic industries, it has been playing an important role in Japanese diplomacy.

Japan joined the Colombo Plan in 1954 and started technical assistance from 1955. Furthermore, Japan was a member country of the Development Assistance Group (DAG), which is the predecessor of OECD Development Assistance Committee (DAC). In 1962, Overseas Technical Cooperation Agency (OTCA), which is the predecessor of Japan International Cooperation Agency (JICA), was established and enabled organized technical assistances in Japanese ODA. The net budget of Japanese technical assistance in 2015 is 321.4 billion yen, amounting to 66.5% of Japanese bilateral donors.

2.2 Bilateral Cooperation

Starting from the science and technology cooperation agreement between the Soviet Union that entered into force in 1973, Japan started to conclude the bilateral agreements mainly between the Eastern Bloc countries. Japan also concluded the bilateral agreements between Asian countries from the 1980s onwards, and between the Western Bloc countries from the late 1980s. Even before the agreements, there were many international meetings with the Western Bloc countries, and also was an abundance of actual international cooperation including atomic research.

Up to now, Japan has concluded the bilateral agreements on cooperation in science and technology or EPAs with provisions on science and technology with 53 countries or organizations (Table 1).

Table 1. List of Japan's bilateral S&T cooperation agreements and EPAs with provisions on S&T cooperation

Region	Country / Organization	Year Implemented
Asia	China	1980
	Indonesia	1981
	India	1985
	South Korea	1985
	Singapore*	2002
	Malaysia*	2005
	Vietnam	2006
	Philippines*	2006
	Thailand*	2007
	Brunei*	2007
Oceania	Australia	1980
	New Zealand	2009
America	Brazil	1985
	Canada	1986
	United States	1988
	Mexico*	2004
Europe	Soviet Union (Currently succeeded by Kazakhstan, Kyrgyz, Uzbekistan, Armenia, Georgia, Ukraine, Belarus, Moldova, Turkmenistan, and Tajikistan.)	1973
	West Germany (Currently succeeded by Germany)	1974
	Romania**	1975
	Bulgaria**	1978
	Czechoslovakia** (Currently succeeded by Czech and Slovak.)	1978
	Poland	1978
	Hungary**	1979
	Yugoslavia (Currently succeeded by Croatia, Slovenia, Macedonia, Serbia, Bosnia and Herzegovina, and Montenegro)	1982
	Italy	1988
	France	1991
	United Kingdom	1994
	Netherlands	1997
	Finland	1997
	Sweden	1999
	Russia	2000
	Norway	2003
	Switzerland	2007
	EC	2011
	Spain	2011
Middle East	Israel	1995
Africa	South Africa	2003
	Egypt	2010

* EPA with prospects on science and technology cooperation

** Executive agreement

3. Science Diplomacy: Science and Technology as a Soft Power of Japan

3.1 Science Diplomacy in Japan

As mentioned in the introduction, debates over science diplomacy in Japan were opened by CSTP, which has been currently renamed the Council for Science, Technology and Innovation (CSTI). One apparent motivation for this was to prepare for the head-of-state level meetings. However, there was also a structural reason for Japan to promote science diplomacy from both the scientific side and the diplomatic side.

3.1.1 Call for Science Diplomacy from Scientific Side

International exchange, keeping in touch with the latest trends of the world and publishing the results of studies to the world, is the most fundamental and essential activity for science and technology area. In addition, some fields are becoming big sciences, for which a single country cannot cover the cost, and there have risen global issues such as environment, energy or infections. These factors made international cooperative research more necessary, and recent development of ICT enabled researchers easier access of each other beyond borders.

Table 2 clearly shows this fact. The figures show the change in the number of internationally co-authored papers in ten years. The world's research trend is shifting to a more collaborative study between multiple countries, and Japan is not an exception. However, the gaps between Japan and other key countries are becoming wider here because Japan has a relatively weak trend. China has already exceeded Japan in the number of the papers.

Moreover, Japan's rankings as a co-authoring partner for key countries are drifting down. Comparing from 2001-2003 to 2011-2013, it moved from 4th (9.8%) to 7th (6.3%) for the United States, from 2nd (16.9%) to 3rd (9.3%) for China, from 8th (5.1%) to lower than 10th (6.2%) for Germany, from 9th (4.9%) to lower than 10th (6.7%) for the United Kingdom, from 2nd (22.1%) to 3rd (14.3%) for South Korea (Saka & Igami, 2015). The presence of Japanese research and development hardly makes itself felt these days.

Due to the situation of Japan described above, the necessity of restructuring Japanese science and technology system in the aspect of international affairs had come to attention.

Table 2. The proportions and numbers of internationally co-authored papers in key countries

	The proportion of internationally co-authored papers						The number of internationally co-authored papers
	2001-2003			2011-2013			2011-2013 (average)
		Co-authored between two countries	Co-authored between three countries or more		Co-authored between two countries	Co-authored between three countries or more	
Japan	20.4%	16.2%	4.2%	28.5% (+8.1%p)	20.0% (+3.7%p)	8.5% (+4.4%p)	21,969
United Kingdom	40.9%	29.1%	11.8%	57.4% (+16.5%p)	33.6% (+4.5%p)	23.8% (+12.0%p)	51,102
Germany	42.5%	29.9%	12.6%	53.7% (+11.2%p)	31.7% (+1.8%p)	21.9% (+9.3%p)	49,797
France	43.4%	30.3%	13.1%	56.0% (12.6%p)	32.9% (+2.6%p)	23.0% (+10.0%p)	36,916
United States	26.2%	20.8%	5.4%	36.5% (+10.2%p)	26.2% (+5.4%p)	10.2% (+4.8%p)	119,493
China	23.8%	20.0%	3.8%	24.1% (+0.3%p)	19.5% (-0.5%p)	4.5% (+0.8%p)	45,040

Note: Original data is from Thomson & Reuter's Web of Science XML. Source: (Saka & Igami, 2015).

3.1.2 Call for Science Diplomacy from Diplomatic Side

On the diplomatic front, the need to utilize science and technology for diplomacy has come up as well. Japan was facing a need to restructure its diplomatic strategy motivated by the decrease of Japan and the rise of emerging countries.

Japan has slipped down from its highest donor status in ODA, which is a conventional tool for foreign diplomacy. Japan's budget for ODA in the general account expenditure recorded its highest at 1.168 trillion yen in 1997. Since then, it has been continuously decreasing, and now reached 542.2 billion yen in 2015 due to the budget squeeze. It is 46% of the aforementioned highest budget and the same level as in 1985. OECD DAC's data on ODA expenditure shows the decrease of Japan's presence in the amount of ODA (Figure 1).

In case of infrastructure development, emerging countries including China and South Korea are expanding their businesses to developing countries with tough competitiveness. Since Japan had already switched most of ODA to "untied" projects, it is hard to show its characteristics by using Japanese enterprises. There were also requests for continuous nurturing of human resource and for advancing the capacity of science and technology from the recipient countries. Not only hardware, but also software assistance such as human resource development or governmental system development, through the assistance of universities or research institutes, were also considered to make the recipient country's commercial environment better, and that would contribute to Japanese enterprises' investment to the countries. In this light, Japan was facing a need to strategically restructure its assistance for developing countries.

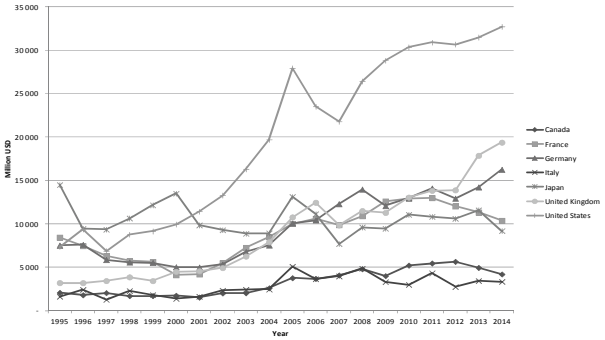
Even though diplomacy has been making use of science and technology as described above, Japan put another light on its advanced science and technology in the wake of the concept of "soft power" coined by Joseph Nye. The Ministry of Foreign Affairs (MOFA) of Japan newly appointed an ambassador for science and technology cooperation in 2005. It symbolizes that Japan started to consider how to utilize science and technology as a source of soft power.

When it comes to "soft power," they also paid attention to the culture represented by pop or traditional cultural contents, and even coined the phrase "Cool Japan." However, contrary to the general perception that the culture is the biggest soft power of Japan, people in most of the countries except for European countries answered that they are more interested in Japan's science and technology. Table 3, which combines results of opinion polls on people's interest about Japan, shows this fact clearly.

One notable point here is that the Japanese technology of industries seems to be well known in the world and could be acting as a source of soft power for Japan, but the Japanese science may be relatively less recognized. Even though increase of the number of Nobel laureates is building up a soft power of Japanese science these days, it is important to distinguish it from the brand image of Japanese industries typified by Made-in-Japan products, and consider the right track for science diplomacy.

When science and technology are asked separately on Table 3, people answered they are more interested in technology than in science. It is true that distinguishing science, technology, and engineering is sometimes difficult and they could be often used interchangeably. However, these figures imply that many countries expect Japan to cooperate with innovative enterprises.

Figure 1. Net ODA from G8 countries



Source: Data from OECD-DAC.

Table 3. Areas of people's interest about Japan (%)

	Asia												Oceania	America								Europe						Africa
	Kazakhstan *1	Uzbekistan *1	Kyrgyzstan *1	Tajikistan *1	Indonesia *3	Malaysia *3	Myanmar *3	Philippines *3	Singapore *3	Thailand *3	Vietnam *3		Australia *11	Mexico *2	Mexico *8	Brazil *2	Colombia *2	Chile *2	Trinidad and Tobago *2	Brazil *4		Spain *5	Turkey *6	Austria *9	Russia *10	United Kingdom *12	Germany *12	France *12	Italy *12	Netherlands *13		South Africa *7
Industry / Science and technology													22																		
Science and technology	**41**	**39**	28	**51**	**63**	**65**	**40**	**72**	45	53	**64**				**52**					**53**		54	**60**	43	24	31	**44**	37	34	18	**60**
Technology														**71**		**74**	**75**	**69**	**64**												
Science/Education														50	19	49	54	47	24						9						
Education																						24									
Culture / Art / Foods / Language															8																**44**
Culture/Art														62	49	59	58	64	50			**57**	30	**50**	**31**						
Culture / Entertainment																										**32**	33	**56**	**40**	37	
Culture	38	15	**30**	19																											
Traditional culture																				23											
Culture and tradition / History / Religion													**40**																		
Religion																				12											
Pop culture																				8						5	16	52	23		
Pop music, idols					33	15	2	19	19	16	20																				
Comics / Animation					52	32	3	34	28	37	33																				
Dramas / Films					37	24	3	21	24	24	28									12											
Martial arts					44	30	7	36	19	27	27									33											
Sports	10	13	12	12	27	11	5	16	7	14	21																				
Japanese language													17	46		41	52	51	25			9		7	6						
History / Literature	15	15	9	7	35	27	15	48	31	31	31																				
History														45	28	45	40	46	25			39	13	36	22	28	31	47	29		23
Literature																				11											
Architecture / Japanese garden																				32											
Society and life style																														**66**	
Way of life and mentality	16	11	9	7	48	64	52	68	56	49	52																				
Japanese people and life style													31																		
Japanese Food					52	54	12	63	**71**	**60**	62		30	56	27	51	42	51	36	26		23	14	37	20	10	15	33	23		
Sake																				4											
Tourism / Nature / Climate																															25
Tourism / Tourist information													30	46	16	60	48	49	10			31		21	14						
Nature / Climate															12									25	14						
Nature																						15									
Economic cooperation	27	14	24	17	36	27	37	41	13	26	39																				
Economy/Business														36	27	30	49	37	20			17		26	11						32
Economy / Trade													21																		
Economy	13	10	23	14	43	38	26	49	28	34	53															18	22	40	41	20	
Business development					36	38	26	50	23	32	54																				
Japanese companies	10	14	13	9																											

	Asia												Oceania	America								Europe							Africa
	Kazakhstan *1	Uzbekistan *1	Kyrgyzstan *1	Tajikistan *1	Indonesia *3	Malaysia *3	Myanmar *3	Philippines *3	Singapore *3	Thailand *3	Vietnam *3		Australia *11	Mexico *2	Mexico *8	Brazil *2	Colombia *2	Chile *2	Trinidad and Tobago *2	Brazil *4	Spain *5	Turkey *6	Austria *9	Russia *10	United Kingdom *12	Germany *12	France *12	Italy *12	Netherlands *13	South Africa *7
Politics / Diplomacy / Military and security													14										8							7
Politics / Diplomacy																									15	20	33	18	29	
Policy / Diplomacy	4	6	6	13																	2									
Politics / Foreign policy					20	16	17	21	17	14	26			13	5	12	12	10	3					6						
Military affairs / Security														7	6	7	8	4	3		2			6						
Effort toward environment and climate change														32	7	35	36	32	10					5						
Policies for environment													26																	
Reconstruction from earthquake																						15								
Others / No idea													4	1	1	1	1	2	2	4	3		13	23					11	

*1 N=300 (for each country), aged 18 or over, Question="Which of the following spheres do you find most interesting about Japan?" (Multiple answers), conducted in 2015.
*2 N=407 (Mexico), 400 (Brazil), 300 (Columbia), 300 (Chile), 300 (T&T), aged 18 or over, Question="What aspects of Japan would you like to know more about?" (Multiple answers), conducted in 2014-2015.
*3 N=302 (Indonesia), 317 (Malaysia), 309 (Myanmar), 307 (Philippines), 305 (Singapore), 300 (Thailand), 304 (Vietnam), aged 18 or over, Question="Which aspects of Japan would you like to know more about?" (Multiple answers), conducted in 2014.
*4 N=600, aged 16 or over, Question="Which of the following are you interested in about Japan?" (Choosing 3 answers), conducted in 2013.
*5 N=1000, aged 18 or over, Question="Which aspects of Japan are you interested in?" (Multiple answers), conducted in 2012.
*6 N=1012, aged 18-65, Question="Which aspects of Japan are you interested in?" (Multiple answers), conducted in 2012.
*7 N=1002, aged 18-60, Question="Which aspects of Japan are you interested in?" (Multiple answers), conducted in 2011.
*8 N=1500, aged 18 or over, Question="Which aspects of Japan are you interested in?" (Multiple answers), conducted in 2011.
*9 N=1012, aged 16 or over, Question="Which aspects of Japan are you interested in?" (Multiple answers), conducted in 2011.
*10 N=3600, aged 10s-70s, Question="Which aspects of Japan are you interested in?" (Multiple answers), conducted in 2010.
*11 N=809, age 20-50, Question="What aspects of Japan would you like to know more about?" (Multiple answers), conducted in 2009.
*12 N=299 (UK), 310 (Germany), 300 (France), 300 (Italy), intellectual people (politicians, professors, industry, law, medical, media, etc.), Question="What aspects of Japan would you like to know more about?" (Multiple answers), conducted in 2007.
*13 N=624, intellectual people (politicians, professors, industry, law, union, media, etc.), Question="What aspects of Japan would you like to know more about?" (Multiple answers), conducted in 2002.
Source: Made from the results of opinion polls conducted by the ministry of foreign affairs, Japan. Some answers are merged into similar answers.

3.2 Discussions over Science and Technology in Japan

3.2.1 Scientific Side

In June 2007, right after the executive members of the CSTP issued the paper, Japanese government established a long-term plan titled "Innovation 25," which describes the direction and measures of Abe administration toward realizing innovative society through science and technology. Science and technology diplomacy was included as one section in the plan.

CSTP (2008) finalized a report of the working group on science and technology diplomacy in May 2008. In the report, the fundamental policy of Japan's science and technology diplomacy is described as follows: (1) Establishing systems in which Japan and its counterparts can enjoy mutual benefits; (2) Generating synergy between S&T and diplomacy for resolving the global issues mankind faces; (3) Working on developing "human resources" that sustain S&T diplomacy; (4) Increasing Japan's international presence. These conclusions are derived from the situations which science and diplomacy

both face as described above.

The report proposes 43 measures to actualize the policy. Although some were newly put into practice by now as the SATREPS, many of them were ongoing international projects at that time like the "Sentinel Asia" of APRSAF. It can be understood that the international programs were re-organized in the aspect of science and technology diplomacy.

After that, CSTP launched another task force to discuss policies on science and technology diplomacy, in order to be included in the 4th Science and Technology Basic Plan. In February 2010, the task force compiled a report (CSTP, 2010).

Considering the situation of science and technology in Japan and the world after the next decade, the report claims that there are four things that need to receive attention: (1) The decrease of Japan's presence in the economic field as a consequence of low birth rate and aging population; (2) Building a concrete relationship between the growth center of the world by breaking free from a dualism between developed-developing countries; (3) The trend of research and development for national security; (4) The internationally cooperative construction of large-scale facilities.

The report urges the government to take these actual measures as well: (1) To build a research and development system integrated with the world (i.e., introducing talented researchers from abroad); (2) To promote research and development which contribute to finding solutions for the common challenges of Asia (i.e., the East Asia Science and Innovation Area initiative); (3) Cooperation in innovation process beyond the research (i.e., social implementation); (4) To explore a new era of science and technology diplomacy (i.e., deploying a new diplomatic strategy in fields where Japan has an advantage, such as environment or atomic energy); (5) To enhance the governmental system to implement international strategies (i.e., granting international strategic capability to CSTP). These points were incorporated into the 4th Science and Technology Basic Plan.

3.2.2 Diplomatic Side

After a while, MOFA also started a study on science and technology diplomacy. An Advisory Panel on Science and Technology Diplomacy was formed, and the panel compiled a report to the minister in May 2015.

The report argues that the government should treat science and technology diplomacy as not just a tool for diplomacy but also an innovative pillar for the Japan's diplomacy.

It also argues for making good use of science and technology diplomacy for the following four kinds of diplomatic approaches: (1) the "diplomacy for proactive contribution to peace" and (2) the "diplomacy that takes a panoramic perspective of the world map," which are the main diplomatic strategies of the Abe administration, (3) the economic diplomacy, and (4) the public diplomacy.

To implement these diplomatic strategies, the report gives 15 recommendations. For instance, to set diplomatic agendas of the "next challenges" for which Japan can readily exercise leadership based on scientific evidence, to promote strategic joint research and development with partner countries with high diplomatic importance, to move ahead with setting up strategic joint projects with emphasis on innovation for emerging economies and the countries that were removed from ODA recipient list, and to appoint a Science and Technology Advisor to the Minister for Foreign Affairs, etc.

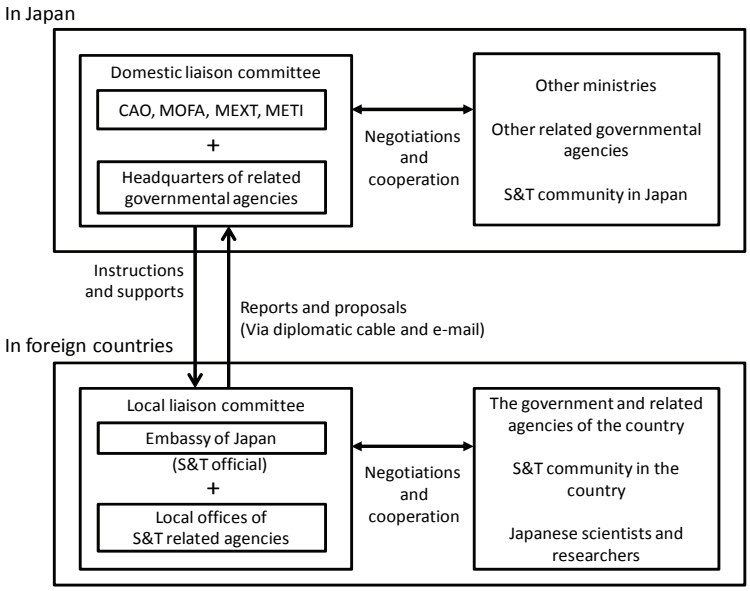
Particularly, the appointment of a Science and Technology Advisor seems to be strongly affected by the United Kingdom's Chief Scientific Advisors (CSAs) that were actively involved in the case of the accident at the Fukushima Daiichi nuclear power plant. In March 2011, when the accident occurred, the UK government Chief Scientific Advisor Sir John Beddington, was asked by the Prime Minister

if UK government needs to consider evacuating British citizens living in Japan. He summoned the Scientific Advisory Group on Emergency (SAGE) which is composed of CSA of every ministry and experts, and inferred a reasonable worst-case scenario. Reviewing the scenario, they judged the probability of the scenario is rather low, reaching the conclusion that it is not necessary to evacuate British citizens from Tokyo, and it was reported to the government. He also conducted risk communication by making related information public via the Internet and having an opportunity to talk directly with British citizens in Japan (MEXT, 2012). Through their active work, the importance of maintaining a system of scientific advice was well recognized in Japan. In accordance with the recommendations in the report, MOFA appointed Dr. Teruo Kishi, professor emeritus of the University of Tokyo, as the first Science and Technology Advisor to the Minister for Foreign Affairs.

3.3 Activities of Science and Technology Diplomacy in Japan

In response to discussions described above, many approaches related to science and technology diplomacy are being carried out in Japan.

Figure 2. The framework of Science and Technology Diplomacy Network (STDN)



Diplomatic missions where S&T officials are appointed (29 missions): United States (Washington D.C., Seattle, New York, Boston, Houston), Canada, Mexico, Brazil, United Kingdom, France (Paris), Germany, Italy, Russia, Sweden, Ukraine, South Korea, China, Vietnam, Thailand, India, Australia, Singapore, Israel, Egypt, South Africa, Mission to EU, Mission to International Organizations in Geneva, Delegation to OECD, and Delegation to UNESCO.

Cities where local liaison committees are operated (currently model 5 cities) and member agencies

Washington D.C. (Embassy of Japan in the US): JSPS, JST, JAMSTEC, JAXA, JETRO in NY, JAEA, NEDO, JNES, Japan Foundation

Paris (Embassy of Japan in France): JSPS, JST, JAXA, JETRO, JAEA, NEDO, Japan Foundation, Delegation to OECD, Delegation to UNESCO, JSPS in Strasbourg

London (Embassy of Japan in the UK): JSPS, JETRO, Japan Foundation

Beijing (Embassy of Japan in China): JSPS, JST, NEDO, JETRO, RIKEN, JICA, Japan Foundation, Universities in Japan

Bangkok (Embassy of Japan in Thailand): JSPS, NEDO, JAXA, JETRO, JICA, Japan Foundation

Source: Ministry of Foreign Affairs, Japan, "Current situation and problems over science and technology diplomacy," a handout of the 1st meeting of the advisory panel on science and technology diplomacy, July 29, 2015. (Translated)

3.3.1 Establishing the Organizational Framework

To reinforce the organizational framework for science and technology diplomacy, Japan operates the Science and Technology Diplomacy Network (STDN), which aims at forming an all-Japan force to utilize science and technology for diplomacy by involving related scientific agencies and communities from 2008 (Figure 2).

Though well-formed as an organizational framework, maintaining human resources to operate the network is the biggest challenge of STDN. Since the number of science attachés who are scientists or officials on loan from MEXT is limited, the S&T officials (Figure 2) cannot be covered by the attachés. Therefore, it is critical to train diplomats in science policy. Besides, number of foreign offices of national agencies is reduced under the current administrative reform. Judging from the situation, it is true that there are still insufficient personnel to sustain Japanese science diplomacy.

In December 2015, MOFA announced the establishment of the Advisory Network for Science and Technology Diplomacy and appointed members of the Council for Science and Technology Diplomacy Promotion, which will be the core body of the network. The network will be chaired by Dr. Kishi, previously mentioned, and will consist of experts and governmental institutes related to science and technology diplomacy. They will start to act from February 2016.

3.3.2 Programs of Science and Technology Diplomacy

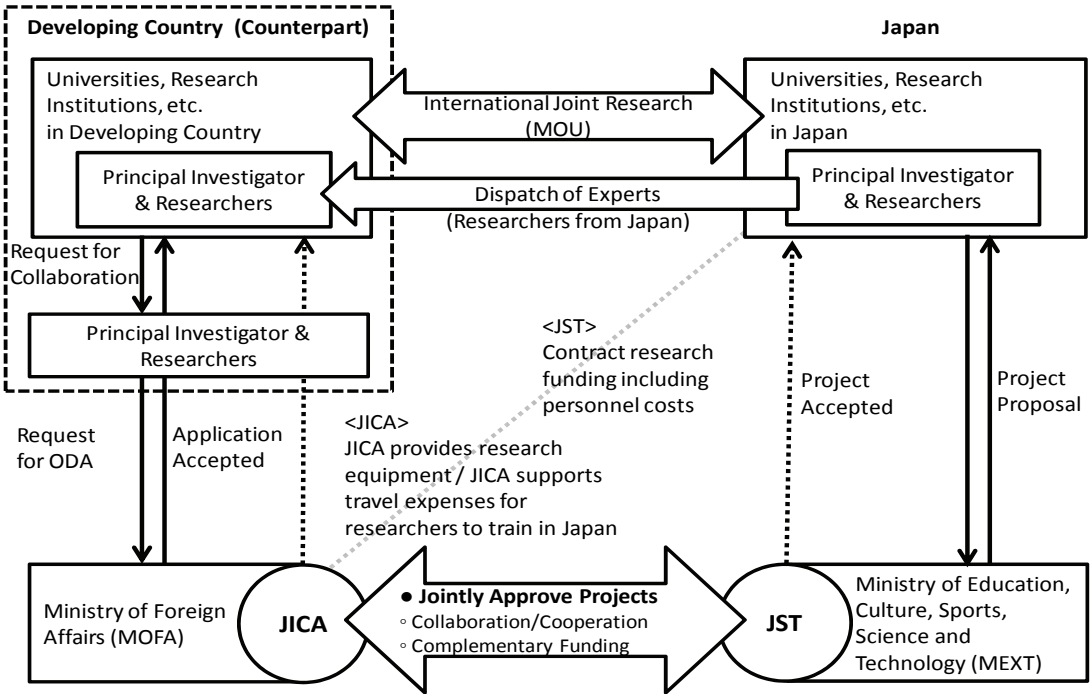
As of FY 2009, there were 46 programs that are related to science and technology diplomacy, listed in the report from the CSTP's task force (CSTP, 2010). Even though most of the programs were already in existence, it is consequential that those international research cooperation programs were situated in the field of strategic diplomacy.

The Science and Technology Research Partnership for Sustainable Development (SATREPS) is the most representative among the programs in terms of science and technology diplomacy. It is directed by Dr. Taizo Yakushiji, who was an executive member of CSTP and who introduced science and technology diplomacy to Japan.

SATREPS is jointly operated by JICA (under the jurisdiction of MOFA) and JST (under the jurisdiction of MEXT). It is a collaboration of the system of competitive funding in the field of research and development, and the system of ODA in the field of diplomacy (Figure 3). (Projects for infectious disease control were transferred to the Japan Agency for Medical Research and Development (AMED) from JST from FY 2015.) In contrast to conventional technical assistances, it conducts international joint researches with universities and research institutes in the recipient countries as well as transferring Japanese science and technology capability. The projects focus on global issues such as environment and energy, bioresources, disaster prevention and mitigation, and infectious disease. It is a dramatic change from conventional technical assistances. SATREPS also has a system to select outstanding researchers for government-sponsored overseas fellows from the recipient countries to Japan.

The advantages of SATREPS go far beyond a diplomatic benefit of relationship building with the developing world. Many of Japanese local universities are involved in the international projects of SATREPS, taking advantage of their strengths in each field. The researchers who practically conducted fieldwork in the developing world can grow to produce international level papers. Besides, SATREPS can be considered to be a part of the Science, Technology and Innovation (STI) policy in that those projects also aim to implement their technology in the society. This means there is a possibility for private sectors to enter the market in the country, for such technology could lead to industry.

Figure 3. The program scheme of SATREPS



Source: SATREPS Brochure 2014.

For these reasons, some people insist that SATREPS should be reformed to be able to work with the countries that were removed from ODA recipient list, or to make it as a matching fund from the government and the private sector.

4. Discussion

Japan is still in an upheaval over science diplomacy. In December 2015, Japanese government decided to continue participating in the International Space Station (ISS) project until 2024, for which an extension was proposed by the United States. Japan and the United States established the Japan-U.S. Open Platform Partnership Program (JP-US OP3) and agreed to increase international cooperation with non-ISS participants, including developing spacefaring countries in the Asia-Pacific region. This is one picture of science diplomacy, strategically building relationships with other countries.

4.1 Considerations for Strategic Bilateral Cooperation

Bilateral science and technology cooperation agreements legally provide basic conditions for international interchange such as stipulations on intellectual property rights. Through the joint committee established by the agreement, they can foster mutual understanding on each country's conditions, circumstances and needs, enabling actual research cooperation. Thus, bilateral agreement is an important tool of science diplomacy, and will continue to be in the future as well.

As is shown on Table 1, many of the agreements have been concluded between Japan and advanced countries. It is evident that making bilateral relationships between Middle Eastern and African countries remains a future challenge for Japan.

However, it should be mentioned that to conclude a bilateral agreement is not an indispensable condition for promoting bilateral cooperation. In fact, Japan had been keeping relationships between the

Western Bloc countries even before the bilateral agreements were concluded. Besides, Table 4, the numbers of researcher exchange between Japan and other countries, shows Japan and Taiwan have quite a considerable amount of research cooperation without an agreement.

Although it is important to strategically conclude agreements between emerging and developing countries, administrative workload to hold joint committees is a source of headache. Unless there is a dramatic increase of the number of staff engaged in science diplomacy, it seems that the government does not have to adhere to keeping a set of the traditional formalities. Whether to use the agreement or not should be considered from strategic point of view. Namely, it is suggested that using an expeditious frame like a Memorandum of Understanding (MOU) focusing on some practical issues can be an actual method instead of using a science and technology cooperation agreement, a comprehensive legal frame.

4.2 Science and Technology Cooperation as a Regional Diplomatic Policy

SATREPS aims to implement its technology in the society, and is working together with the Multilateral Development Banks (MDBs) in some projects. The Asian Development Bank (ADB), which is one of MDBs, also says in its "Strategy 2020" that the developing member countries must build up their science, technology and innovation capacities to achieve the Millennium Development Goals (MDGs) (ADB, 2008). Besides, Japan is the biggest donor of ADB. This situation suggests an idea that Japan and ADB should introduce a science and technology program in reference to SATREPS.

Table 4. Top 20 countries/regions of the number of inbound/outbound researchers of Japan

Rank	Inbound		Outbound	
	Country	Number of researchers departed for Japan from the country	Country	Number of researchers departed for the country from Japan
1	United States	5,615	United States	38,223
2	China	5,376	China	15,930
3	South Korea	3,203	South Korea	14,585
4	Germany	1,775	Germany	8,784
5	France	1,679	France	8,197
6	United Kingdom	1,637	United Kingdom	7,807
7	Taiwan	1,240	Taiwan	6,687
8	Thailand	1,181	Thailand	5,970
9	India	1,009	Italy	5,128
10	Indonesia	941	Canada	3,718
11	Canada	806	Spain	3,655
12	Vietnam	791	Australia	3,583
13	Russia	659	Indonesia	3,504
14	Australia	631	Vietnam	3,414
15	Italy	618	Singapore	3,271
16	Malaysia	449	Switzerland	2,686
17	Spain	363	Netherlands	2,404
18	Switzerland	357	Austria	2,128
19	Philippines	354	Malaysia	2,128
20	Egypt	296	India	2,105

This table shows numbers of researchers' movement during FY 2013 (from April 2013 until March 2014)

Source: "Overview of international research exchange," Press release by the Ministry of Education, Culture, Sports, Science and Technology of Japan on March 4, 2015.

In such case, a funding agency that corresponds to JST in SATREPS that can implement a call for research proposals will be needed. In this manner, considering the future of where science and diplomacy cross, it should be noted that the biggest challenge of Asian research community is the establishment of a joint funding agency for scientific research.

If it comes to internationally matching fund for scientific research, e-ASIA Joint Research Program (e-ASIA JRP), for instance, is one of the existent ongoing projects. It was proposed by Japan as a part of the East Asian Community, and was established in 2012. However, key countries like China, South Korea, and Singapore have not participated in e-ASIA JRP yet.

Although there could be administrative reasons for nonparticipation, there seems to be other reasons in terms of science and technology policy. The program appears to have EU's Framework Program (FP) and its successor Horizon 2020, which contributed to the unification of Europe, as a model, however, there is greater diversity in respect to administration and research systems in Asia than in Europe. It makes an establishment of a joint funding difficult.

A lesson of e-ASIA JRP indicates that the government should not try to promote functionalism approach just because of diplomatic reasons, but should promote it based on a good understanding of an internal structure of scientific projects such as actual need and feasibility for international cooperation observed from the perspective of science and technology policy. This should be a good reference for Korea to realize the establishment of the consultative body for nuclear safety in Northeast Asia that comprises a part of the *Northeast Asia Peace and Cooperation Initiative (NAPCI)*, currently promoted under the Park Geun-hye administration.

In any case, it is difficult to successfully conduct a program without an adequate reason for science and technology front when the program is designed for the purpose of functionalism in international relations for regional integration, in particular. From a diplomatic perspective, regional integration by building the Asian bloc could be a possibility for a future goal, however, considering that the diversity of administrative structure alone is even high in Asia, it is necessary to consider a flexible system in a longer-term than European integration.

Although discussions above focused on Asia in respect to building a bloc by way of example, the funding agency could be founded among countries that share similar values. Considerations should be made from a diplomatic standpoint.

4.3 Enabling Track II Diplomacy with Science and Technology

Track II diplomacy, non-governmental exchange with the countries that are diplomatically difficult to construct an official relation with, is thought to be one of the most important aspects of science diplomacy. Nevertheless, there has been little awareness of such ideas in Japanese science community so far. As is mentioned in section 2.1.1, SCJ's international activities did not intend to bring an advantage to diplomacy of the state, but just pursued the interests of the international science community.

In fact, the most realistic partner to promote the Track II diplomacy for Japan would be North Korea under the current regional situation. However, the science community in Japan has no immediate intention to pursue an international exchange with North Korea. It is because Japanese government, Track I, is fully maintaining a clear policy to approach North Korea under the principle of "dialogue and pressure" in order to resolve the diplomatic issues, so that there is no discretion for scientists left to take part in Track II diplomacy that might disturb Track I.

To put it another way, if the government allows them a certain range of discretion that shall not disturb the official diplomacy, it will be possible to practice Track II diplomacy as a process of trust building between the countries. It needs to be noted that the government should deliberate diplomatic advantages and disadvantages, and then clarify the range of what the government wants Track II to accomplish, in order to promote science diplomacy. Needless to say, even in this case, putting a formal restriction should be avoided as it could ruin the Track II activities by making it a semi-formal state level interaction. Besides, whether to follow the range or not should depend on scientists, ultimately.

Provided that the range is shown, SCJ, which has been actually carrying out international exchange of Japanese science for being "the authority to represent Japanese scientists both within and outside Japan" as written in the Act on SCJ, is expected to commit actively to science diplomacy.

4.4 Considering Competitiveness of Science and Technology

International megaprojects for which a single country cannot fund is also one of the issues of science and technology diplomacy, along with the growth of big sciences. Especially the projects that need to construct large or high-cost facilities, for example, ITER (International Thermonuclear Experimental Reactor), ISS (International Space Station), and LHC (Large Hadron Collider), has been always accompanied by competitive spirit of scientists, domestic political dynamism often motivated by industry, and international political dynamism of regional diplomacy. Here, two kinds of politics are found.

The first one is the politics of diplomacy, which is a type of well-known Science for Diplomacy, i.e., science as a tool for diplomacy. Any megascience that causes a huge amount of financial burden definitely needs persistent commitments of participating countries. Such commitment must be motivated by an international political intention. Without this kind of politics, such megascience projects are unrealistic.

The second one is the politics of science and technology, often hard to observe behind a veil of the politics of diplomacy. This is a driving force of so-called Diplomacy for Science. Even though science and technology is a soft power of diplomacy, the capacity of research and development itself works as a hard power in the world of science and technology, and its political dynamics is not that purely technical. It means there lie the other fundamentals of politics than the ones of diplomacy among scientists and engineers who believe in their own theory or method. It sometimes causes Diplomacy of Science, i.e., an international power game in the field of science and technology. Furthermore, there are competitions among multiple research fields over the limited resources as well. (As a response to this matter, Japan made a priority list of large scientific projects in 2010 similar to those of Europe and the United States.)

These are caused by the competitiveness that originates from the nature of research and development. This kind of competitiveness can even cause a conflict among member countries of a project and can make reaching a consensus difficult. That is to say, the motivation of such scientific research is independent from diplomatic interest. It is still a cross section of science diplomacy, and can be explained by neofunctionalism theory of international relations.

The case of the rivalry of magnetic and inertial confinement nuclear fusion research among Japan, Europe and the United States, and the hard and long path to launch ITER project shall explain above well.

5. Conclusions

Japan is experiencing an upheaval over science diplomacy renaissance, having a background of G7 Science and Technology Ministers' Meeting coming up in May 2016 in Tsukuba, Japan. However, in the meantime, there are few resources left to donate to diplomacy, with Japanese science and technology facing a decline in power. It is necessary to generate new synergy effects between science and diplomacy based on a good understating of both contexts.

To enjoy a good correspondence between science and diplomacy, it should be noted that there is competitiveness in the nature of research and development, even though cooperation has always been highlighted in the context of science diplomacy. This point offers a theoretical framework for an analysis on science diplomacy of Japan as well as of the world.

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