NIA National Innovation Agency

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Study Project on
Development Guidelines of

INNOVATION DIPLOMACY

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Message from
Executive Director

During the past few years global changes and fluctuation have become more intense which have effected the adaptation in all sectors unavoidably. With regard to the disruption during the COVID-19 pandemic, it cannot be denied that the innovation is considered an important policy instrument throughout the entire system covering upstream to downstream, i.e. medical innovation for detecting the infection and providing treatment, technological innovation assisting public health services to be safe and swift. For instance, telehealth innovation supports the screening and early diagnosis along with answering medical questions through an automated system.

This document mentioned the innovation diplomacy accomplishment that National Innovation Agency (Public Organization) (NIA) has practically promoted by recording the essence in the action plan since 2015, and the innovation diplomacy global strategy that will be operated within next three fiscal years (2021-2024). This document made an attempt to make understanding that the diplomacy using the innovation instruments can ease international relations tangible and accomplished. Thai State, as a leading innovation nation of Southeast Asia, can utilize what invested in the studies and researches in response to foreign policy objectives and foreign economic policies. In the meantime, scientific and technological researches are not separated from social studies and researches which have been emphasized by NIA at all times.

This document comprised of explanation and response to important questions. For example, what innovation nation is, what innovation diplomacy is and how it responds to State principle policy, what innovation diplomacy stages include, characteristics of the past innovation diplomacy relations and accomplishment, and in which models NIA shall implement innovation diplomacy according to the future global strategy.

Dr. Pun-Arj Chairatana
Executive Director
National Innovation Agency (Public Organization)

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Definition and Concept

Part 1

Innovation Nation*

Innovation refers to the development and ability in applying technological creativity to increase the efficiency of the manufacturing process of products and services. It is considered as a vital mechanism driving economic growth from the past till present.[1] Models of innovation can be separated variously with regard to products, services or guidelines of the business operation that needs to be driven by the advancement of science and technology. However, creating innovation is not only limited for serving commercial purposes but also leading to the prosperity of the nation and good livelihood of people as a whole.

National Innovation Agency (Public Organization) or NIA defines innovation nation as a nation ready to grow sustainably under circumstances of technological changes of globalization, and is able to create new innovation in response to global future requirements.[2] In relation to the context of globalization and the fourth industrial revolution which emphasizes on the importance of data leads to changes in economy, industry and the way people live their lives.[3] A superpower government like the United Kingdom (ranked as the 5th among the world's most innovative countries) mentioned the importance of the country development to become innovation nation and expressed its standpoint that countries in the world need to have the adaptation ability and utilize technological advancement in fast action so as to cope with new challenges including maintaining competitive

*(Comment from researcher) In a paper published in 2018, it showed that innovation diplomacy must be created before the occurrence of innovation nation. In practice, innovation nations may be created before innovation diplomacy. In addition, both issues do not necessarily have causal relations as processes can be developed simultaneously.

advantage, sustainable economic growth and standard quality of life of people in the country.[4] In addition to earlier mentioned abilities, Asian State like Singapore (ranked as the 8th among the world's most innovative countries) gave additional opinion that an important factor of innovation nation is creative people, who dare to think outside the box. Meanwhile, innovation nations require social structures that are wide open for a variety of ideas, accept changes and are ready to promote people's critical thinking skills and their abilities to apply transdisciplinary knowledge.[5]

An approach to become an innovation nation will not be successful at all if there is no cooperation from all sectors, i.e. public sector, private sector and relevant organizations. Though in most cases the innovation creation majorly resulted from market mechanism force, the role of public sector that is not to be missed in promoting a pace into an innovation nation, as a whole, is creating a condition that supports further development of creative thinking in other sectors by facilitating macroeconomic stability, enhancing market system wide open for competition, focusing on investments for developing human potential including coping with impacts caused by market failure. However, in order to make an investment to enhance a database for serving researches of educational institutions and agencies or for developing innovation associated with health care provision, public sector needs to play a direct role in supporting rules and regulations, procurement, and providing public services so as to create environment and market structures that support the implementation of innovation to help solve new challenges more and more.[6]

Innovation Diplomacy*

Innovation Diplomacy is a concept further developed from science diplomacy in which importance is given to scientific cooperation among many countries in response to shared international dilemmas.[7] Such concept combines the use of innovation advancement in tightening international relations to enhance status and influence of States on international forums with the use of a diplomatic approach to build upon the innovation cooperation between States in response to economics-based benefits and knowledge. The innovation diplomacy concept is based on the concept of neoliberal institutionalism** (with regard to international relations) saying that in the long run various countries will gain benefits from data exchanges, knowledge sharing, and capital exchange independently. International innovation cooperation in the form of bilateralism and multilateralism shall bring about job creation, leading to the development of standard quality of life and economic sustainable growth in the future.[8]

*(Proposal for further consideration) The original definition of innovation diplomacy, according to the 2018 publication, interpreted only the "method", namely the creation of an innovative corporate network and the "form" of relationships at three levels. However, actually the innovation diplomacy ideal or absolute outcome should also induce international political and economic consequences. Therefore, the researchers propose to add the above definition.

**Neoliberal Institutionalism is a theoretical framework for international relations that focuses on the role of international institutions or organizations in building cooperation between states. The theory is based on the assumption that States, as the main characters in the international system, seek their best interests. However States can cooperate under conditions of economic dependence. In this regard, international organizations, both at the regional and global level, become important players in creating the environment that ease to build a framework for international cooperation in order to ensure that states benefit from cooperation rather than not participating in that framework.

Though innovation diplomacy is further developed from science diplomacy, the report presented by the World Intellectual Property Organization (WIPO) in collaboration with Cornell University and European Institute of Business Administration or INSEAD proposed that innovation diplomacy has its own characteristics different from science diplomacy in various dimensions. One of them is an economic accomplishment aspect.[9] This standing point is consistent with a proposal from an article in European Journal of Future Research, which indicates that innovation diplomacy focuses on using a diplomatic approach to enhance national benefits based on economy, trade, and investment by seeking new ways and methods to reduce gaps or differences in various dimensions of each country with regard to society, culture, economy and technology as well as combining this creative thinking with market system to enhance the creativity to achieve maximum benefits.[10]

Moreover, innovation diplomacy reveals the international cooperation that is more complex since the role in promoting the international cooperation is not only limited within the diplomats and Ministry of Foreign Affairs but also the business and science cooperation. Namely, in addition to the public sector that plays a role in setting up policies in general, private sector, business owners including related international organizations have to participate in assessing opportunities and risks of cooperation in creating the innovation throughout a production cycle to ensure that the innovation will give positive outcomes for commercial purpose and people as a whole.[11] In this regard, international organizations are the main characters in managing the international innovation cooperation networks as well as acting as a bridge to distribute the capability and levels of scientific and innovation development from developed countries to developing countries through various cooperation projects for achieving sustainable development.[12]

Amidst the landscapes of international relations in which the importance is given to economy and society driven by knowledge, scientific competence and modern technology are vital factors used to indicate the status of States on international forums. In addition to the goal in becoming an innovation nation, which is important to guarantee the country economic growth and standard quality of life, innovation is a factor that cannot be missed for modern diplomacy. Due to changes in the international conditions and context, innovation diplomacy plays a greater role in being a type of diplomatic instruments, a part of State Innovation Policy, consistent with rapid changes in technology and the connecting world that cannot be separated from each other.

Innovation Diplomacy Stages*

1 Exploring and Informing

This stage is considered an important stage to start bonding relationship with related sectors through the communication and information exchange between each other in a detailed manner to build trust and confidence including looking for a common point and opportunity in developing a cooperation framework for the next stage.

*(Proposal for further consideration) In the 2018 publication, the term framework of innovation diplomacy was mentioned, but this section described the stages in the workshop of innovation diplomacy.

2 

Identifying and Strategizing

At this stage NIA shall play as host to identify strategies and coordinate innovation diplomacy among the networks, Thai State agencies, and international organizations in response to Thailand 4.0 policy.

3 

Cultivating and Connecting

It is the stage of the operation and a vital step to implement mutual cooperation. At this stage, a cooperation framework is probably handled in the form of memorandum of understanding (MOU) or implementation of mutual projects or activities.

4 

Activating and Scaling

After a cooperation framework is made, the emphasis is placed on magnifying the outcomes of the cooperation framework to a wide area and other specific targets.

Characteristics and Relationship Model of Innovation Diplomacy*

Government to Government

The first relationship model of Innovation Diplomacy is bilateral relationship between the government of a sovereign state to the government of a foreign country, operated by NIA and an innovation promotion agency of the country to which a positive relationship is built. The relationship model can be prepared in the form of an agreement such as memorandum of understanding (MOU). Besides, it includes the relationship and role

*(Proposal for further consideration) The term “area” was mentioned in the original release. However, the content is more consistent with the term character or style that emphasizes more on actors. In this 2017-2020 Strategic Document, it was proposed to revise.

of Thai government in international organizations composed primarily of sovereign states as member states (International Governmental Organizations: IGOs) such as the World Intellectual Property Organization (WIPO) and the United Nations Development Programme (UNDP). In this regard, it helps promote the distribution of knowledge among the network countries and enhance the image of Thailand in being an innovation nation on international forums.

Government to Investor

The relationship of Innovation Diplomacy among NIA and foreign investors, who are interested in conducting business with the private sector of Thailand through mechanisms of Ministry of Foreign Affairs, i.e. Department of International Economic Affairs and the Royal Thai Embassy in foreign countries through the major 4 implementation guidelines as follows: 1) enhancing innovation cooperation with relevant agencies in abroad, 2) building marketing opportunity for groups of innovation business in Thailand, 3) developing knowledge and competence in technology to build a cooperation framework for improving Thailand industry sector, and 4) presenting the image of Thailand in innovation to be widely known on international forums according to Thailand 4.0 policy.

The mentioned cooperation framework includes the cooperation among embassies and consulates of other countries in Thailand for knowledge sharing and business matching as well as cooperation with specialized international organizations or agencies such as New Energy and Industrial Technology Development Organization (NEDO) in order to promote the process of knowledge and technology transfer as well as foreign investment to Thailand.

Government to Startup

The relationship of Innovation Diplomacy among NIA and startup focuses on attracting foreign investors and multinational corporations (MNCs) to play a leading role in enhancing environment that supports the development Thai startup through the process of searching for potential of business operators, who have global business mindset, development of a body of knowledge and building marketing base. Besides, NIA is significant force in developing "Innovation District" in Thailand, aiming to plan and design a city plan that can support startup cluster development and innovation entrepreneurs including laying a foundation that can lead to connection, information exchange and knowledge sharing as well as creating the innovation in collaboration with relevant sectors. The significant innovation district is Yothi Medical Innovation District (YMID), considered as a Thailand medical innovation center originated by the cooperation among public sector, private sector, and community. Emphasis is placed on developing 3 aspects of innovations, which are described as follows: 1) medical innovation through biomedical industry, 2) public sector innovation for stepping to be digital government, and 3) innovation for urban development.[13] Furthermore, NIA cooperated with True Corporation Public Company Limited to develop Punnawithi area to become the digital innovation district of Thailand (Punnawithi CyberTech District) so as to create modern working environment and promote the development of digital economy leading to Thailand 4.0 goal achievement in the future.[14]

Innovation Diplomacy

Activities in the Fiscal Year 2016-2020

Part 2

Background of Previous Innovation Diplomacy in the Fiscal Year 2016-2020

- G2G
- G2I
- G2S
- Memorandum of Understanding Signing Activities

Factors, Problems and Constraints in the Operation of Innovation Diplomacy

Background of Previous Innovation Diplomacy in the Fiscal Year 2016-2020

NIA is one of the major characters of Thailand in building relationship in accordance with the Innovation Diplomacy framework among many countries in various regions around the world. The assessment of the Innovation Diplomacy accomplishment in the past 5 years revealed that NIA implemented additional innovation cooperation networks successfully with the world leading innovation nations, i.e. Sweden (ranked the 2nd in the Global Innovation Index), Germany (ranked the 9th), Israel (ranked the 10th), South Korea (ranked the 11th), Hong Kong Special Administration Region (ranked the 13th), China (ranked the 14th), and Japan (ranked the 15th), enabling NIA currently maintain innovation cooperation networks with 17 countries out of 20 countries ranked as the innovation leaders in WIPO's Global Innovation Index (as seen in Table 2.1).

Simultaneously, NIA signed 32 Memoranda of Understanding (MOU) with 17 countries from 4 continents and Greater Mekong Subregion (GMS) for more than 4 years (2015-2019). The innovation cooperation issues covered various dimensions with regard to the development of startup potential, development of knowledge and competence of entrepreneurs and application of technology to increase the operational efficiency of relevant sectors, etc.

Table 2.1

The Top 20 of Global Innovation Index and Thailand in 2019.

No.	Country	Score (0-100) (Median = 33.86)	Ranking of Countries by Groups of Income		Ranking of Countries by Regions	
			Income	Ranking Number	Region	Ranking Number
1	Switzerland	67.24	High	1	Europe	1
2	Sweden	63.65	High	2	Europe	2
3	United States of America	61.73	High	3	North America	1

No.	Country	Score (0-100) (Median = 33.86)	Ranking of Countries by Groups of Income		Ranking of Countries by Regions	
			Income	Ranking Number	Region	Ranking Number
4	Netherlands	61.44	High	4	Europe	3
5	United Kingdom	61.30	High	5	Europe	4
6	Finland	59.83	High	6	Europe	5
7	Denmark	58.44	High	7	Europe	6
8	Singapore	58.37	High	8	Southeast Asia East Asia and Oceania	1
9	Germany	58.19	High	9	Europe	7
10	Israel	57.43	High	10	North Africa and Western Asia	1
11	South Korea	56.55	High	11	Southeast Asia East Asia and Oceania	2
12	Ireland	56.10	High	12	Europe	8
13	Hong Kong (China)	55.54	High	13	Southeast Asia East Asia and Oceania	3
14	China	54.82	Medium high level	1	Southeast Asia East Asia and Oceania	4
15	Japan	54.68	High	14	Southeast Asia East Asia and Oceania	5
16	France	54.25	High	15	Europe	9
17	Canada	53.88	High	16	North America	2
18	Luxembourg	53.47	High	17	Europe	10
19	Norway	51.87	High	18	Europe	11
20	Iceland	51.53	High	19	Europe	12
43	*Thailand*	*38.63*	*Medium high level*	*4*	*Southeast Asia East Asia and Oceania*	*10*

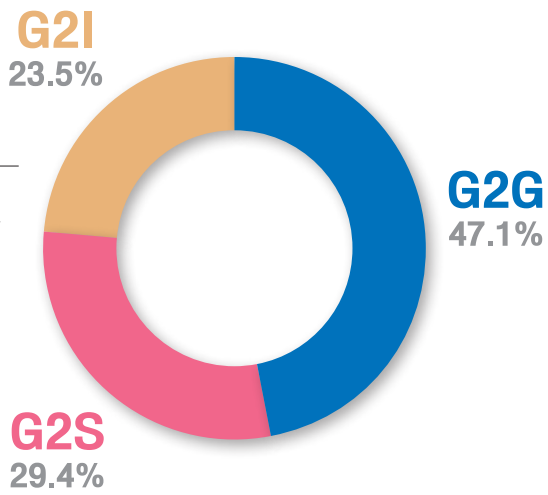
Remark: A gray stripe means countries that had Innovation Diplomacy activities with Thailand. A white stripe means countries at the in-between stage for implementing Innovation Diplomacy activities with Thailand.

Source: *Global Innovation Index 2019: Creating Healthy Lives-The Future of Medical Innovation,* edited by Soumitra Dutta, Bruno Lanvin, and Sacha Wunsch-Vincent. World Intellectual Property Organization, 2019. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2019.pdf.

The consideration of relationship models in accordance with the Innovation Diplomacy conceptual framework found that G2G was the most commonly used relationship model in Thailand based on more than 80 times of activities for relationship implementation, followed by G2S with 50 times of activities, and G2I with more than 40 times of activities, respectively (Diagram 2.1). Currently, Thailand is ranked the 43rd from the 55th in the past 5 years (2015). It cannot be denied that Innovation Diplomacy is an important instrument making Thailand become an internationally accepted medium-size innovation nation.

Diagram 2.1

Proportion of Innovation Diplomacy Relationship.



The model for implementing activities to develop innovation diplomacy on the basis of G2G can be classified into 2 types as follows. The multilateral relationship through participating in international conferences and seminars is organized by international organizations and international networks for exchanging innovation body of knowledge and promoting the image of Thailand in being an "Innovation Nation". The bilateral relationship is carried out through paying a visit to different countries in conjunction with creating networks for integrating innovation cooperation between the two countries with innovation agencies and higher education institutions in that country. The consideration of G2G innovation relationship as a whole at the global level indicated that Thailand, led by NIA, accomplished innovation diplomacy activities more than 80 times in 35 countries across the world while Asia was the continent that Thailand had the relationship under G2G model the most, followed by Europe and other continents, respectively.

Asia

NIA implemented relationship with public sector agencies of countries in Asia about 50 times in 15 countries, i.e. Malaysia, Vietnam, Singapore, Myanmar, The Philippines, Indonesia, China, Japan, South Korea, India, Turkey, Iran, United Arab Emirates, Bahrain, and Israel. In addition, NIA implemented activities for further relationship development with 5 countries in Asia that ranked as the world's top 20 most innovative countries (Singapore, Israel, South Korea, China and Japan). With reference to the statistics of G2G

NIA participated in the booth and was the co-organizer of G2G Forum, an event that brings together groups of government leaders and administrators for the startup promotion policy in Southeast Asia, building networks and developing cooperation at Echelon Asia Summit 2019 during 23-24 May 2019, Republic of Singapore.

innovation diplomacy relationship implementation with Asian countries, it revealed that NIA mostly implemented relationship development activities with China within 14 times, followed by Japan within 8 times, and Singapore within 6 times, respectively.

In terms of bilateral cooperation, NIA had the cooperation at the ministerial level with the Ministry of Industry of Japan and the Ministry of Science, Technology and Innovation of Malaysia, etc. Furthermore, NIA accomplished in establishing the cooperation development with organizations in public sector of various countries in Asia having similar objectives as NIA. For example, the Israel Innovation Authority (ILA) signed an MOU for exchanging body of knowledge and technology development between the two countries. The Japan International Cooperation Agency (JICA) shared the opinions among NIA and other agencies for seeking cooperation guidelines from different agencies in ASEAN countries to enhance Industry 4.0 development together. Agensi Inovasi

Malaysia (AIM) implemented the cooperation development with NIA. Meanwhile, NIA paid high attention to the network establishment with higher education institutions of those countries so as to promote Thai youth's potential. An MOU was signed with the Lee Kuan Yew School of Public Policy, National University of Singapore, aiming to prepare readiness for future education model, especially futures-studies.

As for innovation relationship under the multilateral model, NIA made an attempt to promote the image of Thailand as an "Innovation Nation" on international forums by disseminating body of knowledge and how Thailand implemented innovation policies in conferences or seminars organized by alliance networks as organizations in public sector and regional level, such as the participation in proposing policies and achievement of innovation development in Thailand in ASIALICS International Conference 2019 in South Korea, organized by Asia Association of Learning, Innovation and Coevolution Studies to be a forum for exchanging innovation body of knowledge and policy guidelines of various countries in Asia, the participation in exhibiting technological advancement of Thailand in China–ASEAN Technology Transfer and Collaborative Innovation, and the participation in lecturing the country innovation progress in "The 2nd China-ASEAN industrial Design & Innovation Forum" at Liuzhou, China. NIA was invited to attend both events from the China-ASEAN Technology Transfer Center (CATTC), etc. Additionally, NIA achieved the success in developing networks with international organizations by attending the meeting and lecture in the "1st Asia-Pacific Innovation Forum 2019" at Iran International Conference Center organized by the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and Government of the Islamic Republic of Iran including network expansion through regional organizations such as ASEAN; participation in the 2019 ASEAN-Republic of Korea (ROK) Startup Expo for developing the industry innovation between Korea-ASEAN, etc. Moreover, NIA showed the potential in international forums, and expanded innovation development networks by mutually organizing G2G Forum in Echelon Asia Summit 2019 in Singapore so as to develop networks and cooperation between organizations of public sector, especially on startup originated from the cooperation of three agencies, i.e. Enterprise Singapore, the Malaysia Digital Economy Corporation (MDEC), and NIA.

Europe

NIA succeeded in implementing relationship at the state level under the bilateral and multilateral models more than 30 times with 18 countries in Europe consisting of Switzerland, Sweden, the Netherlands, the United Kingdom, Finland, Germany, Ireland, France, Norway, Austria, Belgium, Estonia, Spain, Italy, Portugal, Hungary, Poland, and Russia. The 10 out of 18 countries were ranked as the top 20 most innovative countries according to the Global Innovation Index. Based on the innovation diplomacy implementation statistics under the G2G model with European countries in the past, NIA mostly had innovative enhancement activities with Russia for 4 times and followed by Austria and Switzerland, 3 times each country, respectively.

With reference to innovation cooperation under the bilateral model with European countries, NIA had cooperation with agencies of public sector, which are responsible for innovation to seek guidelines to tighten innovation relationship at the government level, such as the Ministry of Education and

Science of the Russian Federation in 2015 by attending Open Innovations Forum and Technology Show 2015 and paying a visit to the Skolkovo Innovation Center, and the Hungarian Ministry for Innovation and Technology in 2019 to seek guidelines for expanding innovation cooperation of both countries in conjunction with National Research, Development and Innovation Office (NRDIO) and the Hungarian Export Promotion Agency (HEPA), etc. In addition, as for innovation cooperation at the ministerial level, NIA travelled overseas with the group of Minister of Science and Technology (Thailand) to participate in Startup Nations Summit 2016 organized by Cork City Council and University College Cork, Ireland, and attended a conference to tighten cooperation on science, technology and innovation including paying a visit to the Innovation Centre Berlin Managing GmbH (IZBM), Germany in 2019.

NIA, in collaboration with the Royal Thai Embassy in Vienna and City of Vienna, jointly coordinated and invited delegations from City of Vienna and Urban Innovation to join the 150th anniversary of diplomatic relations celebrations under the theme "150th Anniversary of Friendship between Thailand and Austria" and participated in the Smart City Innovation Exhibition, Bangkok and Vienna, or "Bangkok - Vienna Innovation District Exhibition" at Rattanakosin Exhibition Hall, Bangkok.

In 2018, NIA and the National Innovation Committee (NIC) paid a visit to Austria and Spain to take counsel with agencies of public and private sectors, independent organizations, and significant business sector of Austria, such as Ashoka Austria, Impact Hub Vienna, (Vienna Business Agency), Federal Ministry

for Digital and Economic Affairs (BMDW), Austrian Federal Computing Centre: BRZ, and Pioneers in order to integrate innovation cooperation for economy and society as well as startup cooperation of Thailand and Austria to be more tightened. Furthermore, NIA attended Smart City Expo World Congress (SCEWC) 2018 in Barcelona, Spain in order to present Thailand Innovation District Pavilion for the first time on international forums in cooperation with the alliances, such as True Digital Park Company Limited, Baania (Thailand) Company Limited, and Eastern Economic Corridor (EEC) Office of Thailand.

Moreover, recently in 2019, NIA cooperated with the Royal Thai Embassy in Vienna and City of Vienna to coordinate and invite a group of delegates form City of Vienna and Urban Innovation to attend the 150th anniversary of the establishment of diplomatic relations under the topic "150th Anniversary of Friendship between Thailand and Austria", and joined hand to organize an exhibition called "Bangkok-Vienna Innovation District Exhibition" at Rattanakosin Exhibition Hall in Bangkok, with the purpose of sharing body of knowledge and expanding cooperation on building smart city of both parties.

As for the multilateral relationship model, NIA succeeded in building relationship networks with significant international organizations such as the United Nations Industrial Development Organization (UNIDO) headquartered in Austria so as to attend the conference under the topic "Global Value Chains as Drivers of Structural Change" and to present pieces of work related to Global Value Chain (GVC) of Thailand, and World Intellectual Property Organization (WIPO) in cooperation with International Institute for Management Development (IMD) in Switzerland to seek advice regarding guidelines to develop ranking in the Global Innovation Index (GII). Consultation with WIPO was successful in enhancing tightened cooperation among NIA and global innovation agencies for planning data compilation necessary to the ranking in the global innovation index including listening to essential recommendations to elevate Thailand innovation potential. In addition, NIA participated in international innovation conferences so as to strengthen the image of Thailand about innovation and integrate innovation relationship with numerous countries to be stronger such as IASP World Conference in Moscow, Russia in 2016, and in 2018 in Nantes, France so as to build cooperation networks about ecosystem supporting innovation

development in the models of Innovation District and Science and Technology Park. NIA also attended 2016 EU-SPRI Conference: Exploring New Avenues for Innovation and Research Policies in Lund, Sweden, held in collaboration with CIRCLE Agency and Lund University in order to study Innovation Policy guidelines in Scandinavian region.

Other Continents

NIA implemented relationship with agencies of public sector in other regions in addition to Asia and Europe, i.e. Production Development Cooperation (CORFO) of Chile in Latin America. MOU was signed aiming to expand innovation alliance networks and startup development between the two countries.

NIA plays an important role in acting as a bridge connecting Thailand to foreign investors in order to build innovation relationship under G2I model by means of the mechanism of Ministry of Foreign Affairs, aiming to increase marketing potential and opportunity for Thai innovation entrepreneurs including disseminating positive Thailand innovation image on global forums. Based on the innovation relationship statistics under G2I model as a whole at the global level, Thailand, led by NIA, accomplished Innovation Diplomacy activities more than 40 times in 14 countries around the world. Most of G2I Innovation Diplomacy relationship was implemented in Asia, followed by Europe and North America, respectively.

Asia

As for the implementation of G2I innovation diplomacy relationship, NIA had cooperation to attract foreign investors in several dimensions. Its significant mission is building a good image about investment in Thailand. In case of Asia, cooperation dimensions were interesting, especially in food and agriculture and innovation for society. Since the fiscal year 2015, NIA had activities building innovation diplomacy relationship at the G2I level for 30 times with 10 countries in Asia, i.e. Singapore, Israel, South Korea, China, Japan, Malaysia, United Arab Emirates, Indonesia, Sri Lanka, and Laos. There are 5 among these countries ranked the top 20 most innovative countries of the world. The cooperation statistics revealed that Japan and Singapore were the two countries having innovation relationship activities with Thailand under the G2I model the most, 6 times per country, and followed by Laos, 4 times respectively.

NIA plays a vital role in disseminating a positive image of Thailand to foreign investors through coordination with agencies of public sector in holding exhibitions and conferences associated with innovation and technology such as technology and innovation exhibition in the 2nd Thai Festival in collaboration with Thailand Institute of Scientific and Technological Research (TISTR) and Office of the Permanent Secretary Ministry of Science and Technology in Colombo, Sri Lanka, hosted by the Royal Thai Embassy in Colombo and Thai Trade Center, Commercial Section Royal Thai Consulate in Chennai. The main objective of this exhibition were presenting the success of promoting entrepreneurs from research studies (innovative entrepreneurs), presenting products associated with agriculture and food innovation, and matching businesses so as to tighten innovation diplomacy relationship, and the innovative product exhibition supported by NIA in the 7th Forum on China-ASEAN Technology Transfer and Collaborative Innovation, China-ASEAN Expo 2019 in China, achieving success in attracting investors interested in being distributors of Thai innovative products.

The statistics of activities enhancing innovation cooperation under G2I model revealed that food and agriculture cooperation is one of the first

priority cooperation of the relationship implementation. During 2016 – 2017, NIA attended Global Forum for Innovations in Agriculture (GFIA) organized by Abu Dabhi National Exhibition Center (ADNEC) in United Arab Emirates, every year. Meanwhile, NIA participated in GFIA annually in 2018 in Dubai together with organizational cooperative networks; GrowGroup IFS B.V., Madarfarms, Masdar City, Dubai Future Foundation/Dubai Future Accelerator and Badiafarms and gained success in applying data related to global trends and directions of agriculture for processing to further develop as activities encouraging agricultural innovation at the national and regional levels. The data were used to develop the operation of Thematic Innovation Program of NIA agricultural innovation. The conference was held in cooperation with Masdar city, United Arab Emirates, offering accomplishment in being a role model of plans and guidance for strategic development in elevating NIA area-based innovation in the future. Furthermore, NIA had cooperation with Japan through Mauzen Pharmaceutical, Mie Province Local Government, Food Research Center, National Agriculture and Food Research Organization (NARO), Euglena and NEC Company Limited for innovation associated with natural products, food industry, and energy industry. NIA also attended the event, Rethink Agri-Food Singapore Innovation Week so as to build the cooperation networks with Rethinks, UpGrown Farming, Grow Asia, Leave a Nest, and National University of Singapore (NUS) as well as made an agricultural observatory study in Singapore. Participating in the event led to building cooperation networks for knowledge exchange between Thailand and Singapore and, at the same time, NIA was able to collect data related to agricultural innovation development for considering guidelines for implementing activities that can encourage agricultural innovation such as organizing Farm Fest and specifying AgTech Trend Setter in order to develop Thailand agricultural innovation potential which will attract foreign investors in relevant sectors accordingly.

Another interesting relationship dimension at G2I level is building social innovation cooperation networks. NIA participated in APVN Conference 2018 in Singapore and built cooperation with Asian Venture Philanthropy Network (APVN), Tech in Asia and German Accelerator. The participation in this event gave NIA an opportunity to present its role as being the major

agency promoting innovation to various countries. In the meantime, NIA was able to seek guidelines in setting management strategy and raise funds for innovation for society, promoting investment and mobilizing resources to make benefits to social sector in a sustainable manner. NIA had activities enhancing innovation for society with AVPN again while attending a seminar conference in Japan so as to make a discussion about issues related to building social investor networks in Asia.

Europe

NIA reached the achievement in implementing innovation diplomacy activities under G2I model for more than 10 times in 4 European countries namely: Switzerland, Germany, Norway, and Austria. The first three countries were ranked the top 20 innovative countries according to WIPO's Global Innovation Index. Besides, NIA made cooperation with agencies of public sector such as Ministry of Foreign Affairs and the Royal Thai Embassy in foreign countries to move innovation cooperation forward. Innovation dimension for agriculture and food is still an outstanding issue for implementing innovation activities under G2I model with European countries.

NIA worked collaboratively with the Ministry of Foreign Affairs and the Royal Thai Embassy in foreign countries to seek opportunities to attract foreign investors through activities aiming to disseminate accurate knowledge and understanding, and positive image of Thailand innovation. For instance, the implementation of commercial diplomacy project was created to enhance competitive competence of Thailand in collaboration with the Ministry of Foreign Affairs in Berlin Germany and Vienna Austria. Thai Festival was organized in Bern Switzerland in 2018. In the meantime, NIA was able to make a negotiation to sign MOU with German Accelerator Southeast Asia (GASEA) and Enpact successfully, and participated in Embassy Day and Asia-Pacific Week events in Berlin Germany in 2018. In the following year, NIA, in collaboration with the Royal Thai Embassy in Berlin, attended Asia-Pacific Week event again to bring startup agencies and venture capital (VC) groups to participate in the conference with the purposes to expand the scope

of cooperation and build business and innovation networks, especially cooperation on startup development and innovation for digital economy between Germany and countries in Asia-Pacific region.

Moreover, NIA built cooperation networks on innovation for agriculture and food through participating in international conferences and holding exhibitions in relevant issues. In 2018, NIA attended the 13th International Conference on Agriculture & Horticulture in Switzerland and made cooperation with Innosuisse (Innosuisse - The Swiss Innovation Agency), ieLab, ETH Zurich, Kickstart Accelerator and Swiss Federal Institute of Technology. The conference enabled Thailand to succeed in collecting data about directions of agricultural innovation and learning examples of the development of agricultural innovation in Switzerland for setting guidelines to create ecosystem that can support the development of innovation business potential in agriculture of Thailand in the future. Furthermore, in 2019 and 2020 NIA, in collaboration with the Royal Thai Embassy in Berlin, attended International Green Week Exhibition in Berlin, Germany and built agriculture and food organizational networks comprising SmartHectar, Agro Innovation Lab, FoodTech Campus and Kitchentown from the 2019 conference. The aforesaid conference allowed Thailand to be able to generate "Business to Customer" market to food and agricultural innovation products in overseas and learn about creating ecosystem that can support the creation of startup in agriculture and food technology. As for the 2020 conference, Thai entrepreneurs were given an opportunity to learn about behaviors of European consumers that reflect their lifestyles focusing on health and the use of natural products, being able to connect to distributors and investors from Belgium and Germany successfully.

Other Continents

In addition to Asia and Europe, NIA implemented activities for tightening Innovation Diplomacy relationship under G2I model with United States of America, especially the issues associated with agricultural technology and innovation. In this regard, NIA in collaboration with Department of American

NIA, in collaboration with Thailand Institute of Scientific and Technological Research (TISTR) and Office of the Permanent Secretary of Ministry of Science and Technology (OPS ST), organized technology exhibition at the 2nd Thai Festival in Colombo, Sri Lanka hosted by Royal Thai Embassy in Colombo and Thai Trade Center, Commercial Section Royal Thai Consulate in Chennai.

and South Pacific Affairs, Ministry of Foreign Affairs, participated in the conference and conducting biotechnology exhibitions in BIO World Congress on Industrial Biotechnology for 2018 and 2019 in Raleigh, United States of America. Furthermore, NIA attended World Agri-Tech Innovation Summit 2018 in San Francisco, United States of America while building alliances with Rethinks, Farmers Business Network, mOasis, TerrAion and AgFunder. The participation in such event enabled NIA to achieve success in having guidelines to increase potential of Thematic Innovation Program in agricultural innovation that can follow a direction consistent with the global trend of agricultural innovation. NIA also built a network with AgFunder that has a vital role in promoting agricultural and food startup, and met investor networks, leading to the development of business models to be higher efficient and making Thailand to be able to develop innovation ecosystem that can support potential of startup associated with agricultural technology led by Agro Business Creative Center (ABC Center).

NIA, together with Royal Thai Embassy in Berlin, attended the International Green Week Exhibition in 2019 and 2020 in Berlin, Federal Republic of Germany.

NIA implemented activities for developing innovation relationship under G2S model with multinational corporations and startup in many countries across the world to create startup ecosystem so as to drive Thailand to be a startup hub of Southeast Asia and promote startup of Thailand to reach the international level, by expanding startup alliance networks through participation in startup events held by a certain country or international agencies or paying a visit to agencies of those countries, and building up the cooperation through startup Thailand event responsible by NIA.

In this regard, the consideration of innovation relationship under G2S model as a whole at the global level indicated that Thailand, led by NIA, implemented Innovation Diplomacy activities successfully more than 50 times in 23 countries across the world. Asia was mostly considered the continent having the innovation relationship under G2S model with Thailand, 37 times, followed by Europe, 7 times and other continents, 4 times, respectively.

Asia

NIA implemented relationship development with many countries in Asia for 40 times with 12 countries, i.e. China, South Korea, Japan, Singapore, Israel, Vietnam, Taiwan, Malaysia, Philippines, Indonesia, Bahrain, and Kazakhstan. NIA implemented relationship development activities with China the most within 12 times, and with Japan within 11 times.

NIA aims to develop potential of Thai startup to the international level and develop cooperation networks with startup organizations around the world such as SPARK project that NIA made cooperation with AGW Group from Israel to provide training and startup skill development including selecting startup to have an observatory study in foreign countries participating in conducting international level exhibitions so as to promote the status of Thailand startup on international forums and expand networks with investors. NIA brought startup to have presentation in an international exhibition; Innovfest Unbound in Singapore, and competition winning startup were given an opportunity to have an observatory study at Startup Center in Israel. NIA also paid a direct visit to international startup companies or startup businesses so as to develop cooperation on startup in Thailand. NIA achieved cooperation with unicorn startup multinational companies, especially companies in China with high competition such as Huawei Company (an MOU was signed.) and Alibaba Business School in order to develop potential of human resources for startup and digital business through accelerator programs and Alibaba Netpreneur Training Program, respectively including signing of a memorandum of cooperation with Tus-Holdings to develop startup hub in the EEC area.

As for the innovation relationship under G2S model with Japan, NIA implemented cooperation with many agencies of Japan, both public sector and private sector, in promoting and supporting SMEs and startup development such as in Fukuoka City where NIA sought advice about the development ecosystem and mechanisms used to support startup including area-based innovation, and Knowledge Capital Association which an MOU on innovation and startup was signed as well as startup connection between Kansai region and Bangkok, development of innovation district management, etc.

Moreover, NIA made an attempt to develop multilateral cooperation with innovation leading countries, i.e. Japan and Israel to search for technology and innovation development including promoting potential of SME business and startup together and seeking advice from agencies associated with startup investment from universities and startup requiring advanced technology (Deep Tech Startup) in Japan such as the University of Tokyo Edge Capital Co., Ltd. (UTEC), UTokyo Innovation Platform (UTokyoIPC), Knowledge Capital Association, etc.

Additionally, NIA developed startup cooperation with startup agencies and businesses with other countries through participation in events held by certain countries or international organizations, and built up the startup cooperation in different models such as participating in international economic conference "Astana Economic Forum" in Kazakhstan to give lectures and disseminate Thailand innovation, gaining positive attention for the relationship development from many startup agencies and businesses of Kazakhstan such as BeInTech Ventures, Baiterek, QazTech Venture, LLP Centras, Astana Hub and AIFC FinTech Hub, while some agencies from the mentioned lists are interested in developing an MOU with NIA as well.

NIA also promoted building startup development alliances at regional and international frameworks. Based on the regional level cooperation, NIA organized Southeast Asia Startup Assembly (SEASA), the conference under Startup Thailand 2019 in Bangkok, to tighten the innovation cooperation in ASEAN through exchange of knowledge, experts and economic resources that support the development of startup potential, and to expand cooperation networks on business and innovation to alliances outside the region through investment promotion and experience sharing including potential development and enhancement of the ecosystem of startup to ensure they can facilitate economic expansion sustainably in the future. As for the earlier mentioned conference, Thailand as the 2019 ASEAN Chairman and 12 alliance countries achieved success in declaring "Bangkok Startup & Innovation Declaration" with the main objective to make regional cooperation on research, innovation, and digital startup business in accordance with development strategies of startup ecosystem to achieve the international level including strengthening startup business network at the regional level accordingly. NIA also had the cooperation by country with Vietnam's National Agency for Technology, Entrepreneurship and Commercialization Development (NECTEC) through lecturing in "Techfest Vietnam" 2018 held by Vietnam government sector. The relationship of the two countries has been tightened by signing an MOU in the Startup Thailand 2019 respectively.

Europe

As for the development of relationship under G2S model with European countries, NIA implemented relationship activities for 10 times with 7 countries, i.e. Germany, Portugal, France, Finland, Switzerland, Poland and the Netherlands. Most of them are the top 20 innovative countries of the world.

The Innovation Diplomacy relationship under G2S model was implemented by means of participating in international conferences or exhibitions held in the region to study guidelines for developing startup business at the international level including expanding startup cooperation networks and tightening cooperation such as the participation in Web Summit 2017, the largest startup conference in the world, in Portugal, the participation in Seedstars Global Summit in Switzerland to promote Thailand startup to step into the international level, which Thailand collaborated with Seedstars to hold Seedstars Bangkok Seminar with the purpose to exchange body of knowledge among startup and give opportunities to Thailand startup to compete each other in order to become the country representative in pitching competition in Seedstars Global Summit. NIA made an attempt to utilize the opportunity in participating international events to elevate startup cooperation to be more tightened. For example, the participation in Wolves Summit in Poland happened to carry on cooperation with Startup Poland after an MOU between two countries was signed in Startup Thailand 2019. Additionally, NIA built cooperation networks with Dutch agencies associated with startup ecosystem promotion, especially agriculture from participation in F&A Next 2019 such as StartupDelta, 30MHz, Agro Cares, StartLife, Cannabis College, Piva, etc.

However, NIA implemented relationship under G2S model by paying a visit to European countries. An MOU was signed in December 2018 between NIA and Business Finland on startup cooperation after Finland paid a visit to Thailand during August 2018 to have innovation discussion with NIA, reflecting the success in implementing Innovation Diplomacy policy.

Other Continents

NIA implemented Innovation Diplomacy activities with numerous countries in various regions, i.e. United States of America in North America, Chile in South America, and Australia in Oceania.

As for the implementation of relationship under G2S model with countries in other continents, NIA most likely attended or participated in activities and conferences at the international level to expand cooperation

NIA organized the Southeast Asia Startup Assembly (SEASA) as part of the Startup Thailand 2019 conference in Bangkok to strengthen the cooperation on innovation in ASEAN region through the exchanges of knowledge, experts and economic resources which ease to develop the potential of the startup.

networks with startup agencies. With reference to the implementation of Innovation Diplomacy activities with Chile, NIA paid a visit to CORFO and sought advice about guidelines supporting innovation and startup. An MOU was signed to develop startup ecosystem of the two countries, especially the support given to startup in the field of advanced technology (Deep Tech).

With regard to the expansion of startup cooperation through participating in international conferences, NIA achieved great success from participating in three activities since 2018 onwards. NIA expanded startup networks with public sector and business sector of Australia. An MOU was signed from the participation in startup event "DLD Tel Aviv Innovation Festiva 2018" in Israel. Thailand startup were given an opportunity to participate in the event, i.e. TTSA, Take me tour, Alistro, Drivematte and QueQ. A sample of Australian agencies that NIA developed the relationship with included CEA, Australia-ASEAN Business Council, The precinct Advance Queensland, DITID, The capital Austrade, Fishbumers Brisbane. NIA made an attempt to implement innovation diplomacy activities with the United States of America, the 3rd innovative country of the world, by participating in "World Agri-Tech Innovation Summit 2018" to build a network with Agfunder supporting AgriFood Startup to promote a high number of AgriTech Startup groups

in Thailand. The participation in SXSW 2019 in Austin, United States of America was conducted to learn innovation, make cooperation, and seek networks to fulfil music, art, and recreational ecosystem (MAR Tech).

Memorandum of Understanding

Signing Activities

Besides the above-mentioned activities to enhance different innovation cooperation, NIA achieved great success in signing memoranda of understanding (MOU) on innovation, especially in Asia. NIA signed more than 19 memoranda of understanding with 7 countries in Asia which comprised of Singapore, Israel, South Korea, China, Japan, Vietnam, Kazakhstan and Cambodia, within 4 years. In this regard, Japan was considered the country having the highest innovation cooperation frameworks with Thailand. New Energy and Industrial Technology Development Organization (NEDO) is one of major organizations that coordinated with NIA to provide cooperation on research and innovation development of the two countries including supporting doing business together of Thai startup and Japan startup, leading to creating environment conditions that support the development of technology and innovation potential of both parties. NIA also prepared memoranda of cooperation with many agencies in China such as memorandum of cooperation on research and innovation of NIA with National Science and Technology Development Agency (NSTDA) and Huawei Technologies (Thailand) Company Limited for making understanding of advanced technology of dialogue partners to promote the implementation in accordance with Thailand 4.0 policy to be successful and to drive Bangkok in becoming a startup hub of Southeast Asia and an agreement for developing Eastern Economic Corridor (EEC) to be a startup hub to promote EEC digital business to meet standard and competitive advantage at the international level. NIA had tightened the cooperation with the National Technological

Innovation Authority of the State of Israel through funding mechanisms with companies of the two countries for investment promotion between each other. In addition to cooperation with each country, NIA had a memorandum of cooperation at the regional level with Mekong Institute (MI) in making a cooperation framework at Mekong subregion level (comprising 6 country members, i.e. Cambodia, China, Laos, Myanmar, Thailand, and Vietnam) through exchange of information, body of knowledge, strength, and weakness of each other, leading to the potential development and cooperation integration at the regional level in a sustainable manner.

In addition to innovation cooperation with Asian countries, NIA played an important role in making the innovation cooperation frameworks with Europe, the world's leading innovation region. In 2018, NIA prepared 9 MOU with 7 countries in Europe, comprising the Netherlands, Finland, Germany, Belgium, Spain, Portugal, and Poland according to the innovation index. The startup business development is one of cooperation frameworks that is clearly seen and successful the most. NIA signed memoranda of cooperation with public sector and private sector agencies of Europe; non-profit seeking organizations like German Accelerator and Enpact e.V. of Germany and agencies focusing on potential development of startup in Poland and Portugal including agencies focusing on encouraging specific capability of startup like Amsterdam Health and Technology Institute (AHTI) of the Netherlands that plays an important role in giving innovation assistance to health care entrepreneur and development of innovation potential of universities with educational institutions such as Katholieke Universiteit Leuven and Ghent University in Belgium.

In addition to the innovation cooperation between Thailand and the two regions as mentioned earlier, NIA implemented negotiation in preparing memoranda of cooperation on innovation successfully with countries in two continents, i.e. Oceania (with Australia) and South America (with Chile). In case of Australia, NIA had cooperation with QUT Creative Enterprise Australia (CEA) to generate alliances in building startup networks between the two countries including promoting mutual effort in making economic ecosystem that supports an opportunity for mutual implementation of startup groups from both parties. Moreover, NIA achieved success in signing two MOU

on innovation with Chile. The first MOU is the cooperation with production development corporation (CORFO) of Chile to create ecosystem that supports the growth and operation of new innovation organizations and startup, and to carry on cooperation on innovation startup. Moreover, Thailand made the cooperation with Pontifical Catholic University of Chile in exchanging information and experience about the development of college of entrepreneurship, and promoted mutual cooperation on business and investment for technology development.

In case of Africa and Antarctica, they are the two continents being in the process of infrastructure development that will support the creation of innovation in the future. Therefore, NIA is in the waiting period for developing Innovation Diplomacy relationship with these two continents.

Table 2.2

Cooperation Activities on Innovation Diplomacy of Thailand with Top 20 Leading Innovation Countries in the World

No.	Country	MOU	Innovation Agencies with Cooperation	Innovation Diplomacy Relationship Models
1	Switzerland	None	World Intellectual Property Organization (WIPO)	G2G
			Innosuisse The Swiss Innovation Agency	G2I
			ieLab, ETH Zurich	G2I
			Kickstart Accelerator	G2I
			Swiss Federal Institute of Technology	G2I
			Seedstars Global Summit	G2S
2	Sweden	None	Lund University	G2G
			Business Sweden	G2G
			National Innovation Council	G2G
			Vinnova	G2G
3	United States of America	None	World Agri-Tech Innovation Summit 2018	G2S, G2I

No.	Country	MOU	Innovation Agencies with Cooperation	Innovation Diplomacy Relationship Models
			Bio World Congress on Industrial Biotechnology	G2I
			SXSW 2019	G2S
			TechCrunch Disrupt Conference	G2S
4	Netherlands	2	Amsterdam Health and Technology Institute	G2G
			StartLife	G2S
5	United Kingdom	None	None	-
6	Finland	1	Innovaatiorahoituskeskus Business Finland	G2S
7	Denmark	None	None	-
8	Singapore	2	Lee Kuan Yew School of Public Policy, National University of Singapore	G2G
			Nanyang Polytechnic	G2G
9	Germany	1	German Accelerator Southeast Asia	G2I
			Enpact e.V.	G2I
			CeBIT	G2G
			Fraunhofer UMSICHT	G2I
			ANUGA, Kölnmesse GmbH	G2I
			International Green Week 2020	G2I
10	Israel	1	The National Technological Innovation Authority of the State of Israel	G2G
			Israel Innovation Authority (IIA)	G2I
11	South Korea	3	ARISTO Production Company Limited	G2S
			Lotte Accelerator Corporation	G2S
			ASEAN Business Center	G2I

No.	Country	MOU	Innovation Agencies with Cooperation	Innovation Diplomacy Relationship Models
			Korea SMEs and Startups Agency	G2S
			Daegu Centre for Creative Economy and Innovation Daegu (CCEI Daegu)	G2S
12	Ireland	None	Cork City Council; University College Cork	G2G
13	Hong Kong (China)	1	Hong Kong Trade Development Council (Bangkok Office)	G2G
14	China	2	Huawei Technologies (Thailand) Co., Ltd.	G2S
			TUS-HOLDINGS Co., Ltd.	G2S
			China-ASEAN Technology Transfer Center (CATTC)	G2G
15	Japan	6	New Energy and Industrial Technology Development Organization of Japan (NEDO)	G2S, G2I
			Fukuoka City	G2G
			Knowledge Capital Association (KC)	G2S
			Ministry of Economy, Trade, and Industry	G2G
			DENSO Corporation	G2I
			JETRO	G2I
16	France	None	Business France	G2S, G2I
			Bpifrance	G2S, G2I
			Paris & Co.	G2S, G2I
			Dassault Systemes	G2I
17	Canada	None	University of British Columbia	G2G
			Collision Toronto	G2S
18	Luxembourg	None	None	-
19	Norway	None	Innovation Norway	G2G
20	Iceland	None	None	-

Factors, Problems and Constraints
in the Operation of Innovation Diplomacy

Throughout the operation of Innovation Diplomacy, National Innovation Agency (Public Organization) (NIA) successfully builds innovative networks with government and private sectors worldwide. This enhances Thailand's innovation development for both entrepreneurs and startup. However, NIA faces operational constraints that affect the achievement of Innovation Diplomacy goals in G2G, G2I, and G2S models which share the common problem factors as follows.

The first factor is **Tight Budget.** The tight budget results in the potential expression of Thai entrepreneurs and startup on international forums and consultation with various countries. NIA implements a strategy to bring potential Thai entrepreneurs and startup to attend international innovation events and discuss with agencies in target countries, including foreign embassies in Thailand, Royal Thai Embassies in foreign countries, and foreign organizations. However, with the tight budget, NIA must select only certain potential business representatives. This may not reflect the broad spectrum of diverse and potential Thai private companies and startup, which is essential in raising awareness and promoting the roles of the private sector and Thai startup in abroad.

The second factor is **Geographic Remoteness.** This is a critical factor in the Innovation Diplomacy strategy of the three models. The geographic remoteness results in relatively high travel and operating expenses, especially in North America and Latin America. Therefore, the development of innovation relations with countries in the regions must be highly considered as worthiness and effectiveness by formulating innovative cooperation development strategies, especially in the outstanding areas in which those countries specialize, such as the Agricultural and Biotechnological innovation strategy with the United States of America. However, NIA must also consider the opportunities on network expansion as much as possible

in the relationship implementation, which will focus on attendance at large conferences such as the World Agri-Tech Innovation Summit 2018 in San Francisco, United States of America which is considered as the summit of global agricultural innovation conference as well as the meeting place for entrepreneurs and investors around the world. For the Latin American region, NIA was unable to conduct ties with several countries in the region at the same time; therefore, NIA established the strategy for the region through the cooperation with Chile, a country with high innovation potential. This is an important opportunity to expand relations with other countries and to open up markets in the region, which may take time to achieve the mission. As a result, NIA is unable to formulate a strategy that extends innovation networks with target countries within short period of time.

The third factor is **Technological Differences.** This factor is also a major hindrance to the development of mutual innovation relation. With rapidly changing industry model, NIA must be ready to promote startup that are in line with the mentioned changes. NIA focuses on Agricultural Technology (AgTech), Financial Technology (FinTech), Travel Technology (TravelTech), Music, Arts and Recreation Technology (MarTech). However, with some technological and regulatory differences, this may not lead to matching with large international businesses and investors. For example, in the event of joining SXSW 2019 in the United States of America, which brought MarTech startup representatives to exhibit works to promote the role of Thai startup in the international arena and to expand business cooperation with foreign countries. As a new industry, it needs potential promoting period and no business matching is established. However, NIA invited representatives from SXSW to attend the Startup Thailand event to further develop the industry.

The last factor is **the Nature of the Startup Market.** Although NIA is promoting Thai startup into overseas markets through Innovation Diplomacy, especially in the United States of America and European markets which are large startup markets as well as large numbers of population. However, the two regions are considered as high competitive markets, especially the European market expansion, which is closed market subject to legal issues and market entry restrictions, including issues of startup characteristics that may not comply with the lifestyles of the population in the region.

Case Studies and Lessons from Leading Countries under the Innovative Strategic Framework Proposal

Part 3

Case Studies of Innovation Policy in Europe

Innovation Policy is one of the policies that the European Union pays high attention to as it directly impacts economic growth, employment and competitive edge of European Union in the international arena. Not only Innovation Policy of the European Union is based on the legislation that laid the groundwork for industrial development, research, and technology found in the Treaty on the Functioning of the European Union: TFEU, but also linked to the policy of the European Union in other dimensions such as employment, environment, industry, and energy. In this regard, the primary goal of the European Union on developing innovative policy is to apply research results in order to improve the quality of products and services, to increase the Union's competitiveness in the global market and to enhance the quality of life for people.[15] The European Union defines the strategies to achieve the objectives of being a complete shared market of knowledge, research, and innovation as follows.

1 Innovation Union (IU)

The European Union has set the goal of creating the Innovation Union (IU), which is the integration of their member states' Innovation Policy to be harmonized. This is one of the seven strategic goals for achieving smart, sustainable, and inclusive economy by 2020.* The European Union aims to increase research investment to 3% of GDP.[16] The above policy is to create favorable conditions for innovative researches and establish an approach

*(1) Creating Innovative Union (2) Strengthening the potential and attractiveness of the European education system on the world stage (3) Accelerating the process of accessing the broadband and creating a digital common market (Digital Single Market) (4) Efficient use of resources (5) Policy implementation to develop a sustainable industrial base and increase competitiveness in a globalized world (6) Develop labor potential and facilitate free movement (7) Creating a framework for cooperation to tackle poverty

toward funding sources to support these efforts systematically. In this regard, the European Commission acts as the main agency to support curriculum development projects in order to bridge the gap between innovation potential of the member countries.[17]

In addition, the European Union has put in place measures to rank and monitor comparative innovation development of the member countries through the European Innovation Scoreboard system. In addition, the European Union has set up Regional Innovation Scoreboard system to assess Europe's innovation competence across the region and further covers non-European Union countries like Norway, Serbia, and Switzerland.[18]

2 Horizon 2020

The European Union has established the Horizon 2020 policy framework as a financial instrument, which in the 6-year time frame (2014-2020) with a budget of 80 billion euros. This framework is made to guarantee the success of Innovation Union and the competitiveness development efforts of the European Union on the global stage by 2020[19]; in addition, it is also a collaboration between Framework Program for Research, Competitiveness and Innovation Framework Program, and the European Institute of Innovation and Technology (EIT) which are the fundraising programs for existing researches and innovations of the European Union.[20]

The Horizon 2020 guidelines are designed to mobilize resources for the development of three key factors that will identify the competitiveness of Europe on the world stage: scientific excellence, industry leadership, and social reality challenges. Horizon 2020 is also a key tool in achieving innovative union commitments through guaranteed ease of access to projects, opening up areas for SMEs participation, strengthening financial instruments, strengthening cooperation between sectors, supporting innovation by the government sector, etc.[21]

3 European Research Area (ERA)

The European Union has started efforts to create the European Research Area (ERA) as a result of an initiative of the European Commission since 2000 to be joint innovative marketplace of Europe on basis of world market demand. This has the ultimate goal of contributing to the free movement of researchers, scientific knowledge, and technology[22], while creating coherent research policy at the union and national level.[23] Action to achieve this goal is guided by the European Research Area and Innovation Committee (ERAC), a strategic and policy advisory panel on research and innovation composed of the member states of the European Union and the European Commission, including other countries involved in Innovation Policy, but not members of the European Union such as Norway, Switzerland, Iceland, Serbia, and Israel ,who can join as observer countries.[24]

The path to building a complete European research area is divided into 3 phases. Phase 1 (2000-2007) focuses on organizing research system in Europe through the management of differences in research system in each member state, and seeks to integrate inconsistent innovation policies at the national and union level. Phase 2 (2007-2012) is to strengthen relations between member states and the Commission to drive the free movement of knowledge. Phase 3 (2012-2020) creates a common market for knowledge, research, and the unified innovation of the European Union.[25]

4 Policy on Research and Innovation of the European and Switzerland Economic Area

The research and innovation policy of the European Economic Area (EEA) appears in Protocol 31 of the European Economic Area Agreement on Cooperation in Specific Sector in the four freedoms of movement. The objective of this agreement is to support the free movement of researchers and scientific knowledge in order to achieve the goal of driving Europe's smart, sustainable, and inclusive growth by 2020.[26] Protocol 31 provides three countries of EFTAs (out of four member countries) that

are Iceland, Liechtenstein, and Norway can participate in activities related to the development of research, innovation and technology of the European Economic Community.

Horizon 2020 is a vital tool in the integration of research and innovation policies of various countries in the European Economic Area, particularly the EFTA member states in accordance with the main policy of the European Union. In this regard, Norway and Iceland were the first countries outside the European Union to participate in the Horizon 2020 framework. Norway placed importance on Horizon 2020 as well as being part of the European Research Area as the core of innovation policies.

In the case of Switzerland, it is not a member of the European Economic Area, but it is a part of Horizon 2020 as well as other EU and EFTA countries. The ratification of the Protocol on Extending the Agreement between the European Union and Switzerland on the free flow of persons to Croatia in 2016 was a prerequisite for Switzerland to play a full role in every framework of cooperation under Horizon 2020, and further strengthen and upgrade both research and innovation relations.[27]

Case Studies of Innovation Policy in the United Kingdom and Being an Innovation Nation

The United Kingdom is a country of excellence in science and innovation advancement both at the continental level (ranked the 4th) and globally (ranked the 5th) in line with the main economic base of service-oriented countries. However, over the past several years, the United Kingdom has always benefited from the European Union's development research funding.[28] The context of the changing relations between the United Kingdom and the European Union following the Brexit process starting in December 2020 made it necessary to review the UK's policy on innovation responsibilities for both the public and private sectors as follows.

1 UK Research and Innovation (UKRI)

UK Research and Innovation is quasi-autonomous non-governmental organizations, which work with universities, research organizations, businesses, charities and the government, to create the environment easing researches and innovations with the Department for Business, Energy and Industrial Strategy (BEIS) directly to the UK government functioning as the main financial supporter.[29] UKRI aims to transcend the knowledge boundaries of its citizens, while striving to make positive impacts on the economy, society, and culture through laying a solid foundation for research and development of four innovations consisting of the followings: first, focusing on building people with current and future potential, second, creating open, transparent and accessible research and development system, third, supporting the culture that embraces diversity based on equality, and fourth, promoting standardized research culture as well as focusing on cooperation and unity.[30]

2 Innovate UK

Innovate UK is non-departmental public body in charge of the innovation of the United Kingdom that works with government, business, and public sectors under the supervision of UKRI. The organization's main objectives are to seek, classify, and identify scientific and technological development that will lead to future economic growth. Innovate UK is responsible for meeting innovative creators with initiative ideas in different fields, providing budget support to the strongest development opportunities. Innovate UK also acts as an agency to connect innovators and partners in relevant sectors, assisting the innovators in building their business strengths from the ground up.[31]

3 Nesta

Nesta (formerly National Endowment for Science, Technology and the Arts: NESTA) is a dedicated innovation development foundation initially funded by the National Lottery Fund of the United Kingdom. Nesta focuses on

dealing with problems that arise in society with five key areas of focus. The first area is *Health* to overcome the limitations of healthcare expenses affected by the social structure with numbers older people in need of long-term healthcare. The second area is *Education* to build the needed skills for the younger generation to meet the needs of economic structure that relies more on automatic machinery. The third area is *Arts and Creative Economy* to strengthen creative industry growth by integrating with digital technology. The fourth area is *Government-led Innovation Creation* to promote efficiency in the implementation of government programs that are in line with the real needs of the people, while encouraging greater participation of the public sector. Last, the fifth area is *Innovation Policy* to help and advise the government to create conditions most favorable for economic growth and meet the needs of society as much as possible.[32]

Case Studies of Innovation Policy in ASEAN

ASEAN Member States agreed on the importance of interstate cooperation in building a tightly integrated ASEAN Community in both political, economic, and social dimensions. ASEAN Member States al recognized the importance of fostering relations among the populations of each Member State through educational cooperation and cooperation frameworks on Science, Technology and Innovation (STI) to strengthen the potential of human resources and ensure the sustainable economic growth of the community. Since the 16th ASEAN Ministerial Meeting on Science and Technology in 2015, ASEAN has defined ASEAN Plan of Action on Science, Technology and Innovation (APASTI) for 2016-2025. The Plan is primarily aimed at addressing new challenges and fostering public-private partnerships that will lead to the exchange of knowledge and the free movement of talents to create sustainable and indivisible economic integration that will lead to bridging the development gap among member states and creating the economy with competitive potential in the global market. In this regard, APASTI laid out

guidelines for ASEAN to achieve that goal through three forces. The first force is to foster stronger collaboration between academics, research institutes, centers of excellence, and private sector to create an ecosystem that facilitates the development, exchange, and utilization of technology. The second force is to strengthen the free movement of scientists and researchers, foster connections at the public level, and encourage the participation of women and youth in science, technology, and innovation. Last, the third force is to create an innovative system and smart partnerships with relevant dialogue and partners to provide scientific, technological and innovative support, and to educate small enterprises that will lead to talent development in the next race.

In addition, ASEAN defined ASEAN Innovation Roadmap 2019-2025 based on ASEAN Innovation Declaration as an approach to the potential development in regional innovation through a framework of initiatives and responsible agencies in 6 areas: 1) policy, 2) enterprise readiness, 3) workforce readiness, 4) science, technology, and innovation approach for achieving the sustainable development goals, 5) intellectual property rights system, and 6) cooperation between dialogue. ASEAN also provides the main agencies responsible for Innovation Policy as follows.

1 ASEAN Committee on Science, Technology, and Innovation (COSTI)

The ASEAN Committee on Science, Technology, and Innovation (COSTI) acts as a key field-specific mechanism for integrating cooperation under the existing and upcoming innovation policy framework in the future between various sectors of ASEAN. The work of the Commission is supported by technical support and coordination from the ASEAN Secretariat and directly report to the Committee of Permanent Representatives to ASEAN and the ASEAN Socio-Cultural Community Council (ASCCC). One of COSTI's main goals for 2020 is the implementation of the ASEAN Innovation Strategy for 2019-2025 to achieve curriculum creation for human resource development and system planning to promote the talent movement of researchers

from educational institutions to enhance regional cooperation in science, technology, and research.

2 ASEAN Science and Technology Network (ASTNET)

ASEAN Science and Technology Network (ASTNET) is a major project under the supervision of COSTI. ASTNET's main mission is to build an internet information network at the ASEAN level. ASTNET is also an important connection point for connecting ASEAN science and technology databases with member countries' scientific, technological, and industrial databases. The role of ASTNET is an important factor that will support the monetary, administrative, control and coordination work among projects under the COSTI framework as well as increasing the efficiency of cooperation among member states.

In addition to the cooperation on innovation within the ASEAN framework, each ASEAN member country has established its own innovative policy framework in line with its political, economic, and social contexts. The next part is the summary of the innovation policy of the top three ASEAN member countries on innovation including Singapore (the 1st in ASEAN; the 8th in the world), and Malaysia (the 2nd in ASEAN; the 35th in the world) respectively.

Case Studies of Innovation Policy in Singapore and Malaysia

Singapore has experienced a leap in innovation since gaining political independence in 1965. Singapore has surpassed demographic and resource constraints through attracting multinational companies to invest in infrastructure, develop human resources and transfer knowledge of technology to their personnel. However, in 1990 onwards, Singapore has increasingly

focused on the research and development capabilities of the country's population and has established "Research, Innovation, and Enterprise" policy framework as a core theme of the national strategy for economic and social development driven by innovation and knowledge. In 2020, the Government of Singapore, as a key player in innovation knowledge development, has funded over $19 million dollars.[33] The key element of Singapore's innovation policy framework is "Home" strategy, which includes "Home for Business" to set up a core operational framework across all industries, "Home for Innovation" to create an ecosystem conducive to the development of entrepreneurial innovation potential, and "Home for Talent" to apply national innovation strategy in response to global market direction.[34]

Key entities under Ministry of Trade and Industry (Singapore) responsible for driving and implementing Singapore's innovation policy include Agency for Science, Technology and Research (A*STAR), the independent committee responsible for supporting scientific research and innovation to promote economic growth[35], and Economic Development Board (EDB), a government agency that provides innovation strategies to promote Singapore's role as the global economic and innovation hub.[36]

Another ASEAN member state with excellence in innovation is Malaysia, which has experienced rapid innovation development since the announcement of the New Economic Model (NEM) in 2010. The policy has focused on the development of the manufacturing sector based on its own innovative capabilities as a driving force for sustainable economic growth, rather than reliance on low-wage immigrant workers in the past. Malaysia has developed National Innovation System (NIS) focused on understanding the interconnection of the various sectors involved in the innovation creation process in government agencies, businesses, universities, research institutes, and individuals as the main driving force in the development of technological potential. In this regard, the government was a key player in Malaysia's driving and advocacy for innovation creation, with the implementation of national innovation policies carried out by Ministry of Science, Technology, and Innovation: MOSTI and Ministry of Higher Education: MOHE as key agencies.[37]

Case Studies of Innovation Policy in Australia and New Zealand

Australia (ranked the 22nd on the World Innovation Index) is a country with a strong focus on empowering innovation, technology, and science as important factors leading to economic strength, job creation, and government-driven quality of life. Since 2015, the Australian Government has announced the National Innovation and Science Agenda (NISA)[38], which aims to emphasize the importance of science, research, and innovation as factors leading to job creation and economic growth in the long term and to fulfill government investments in science, research and overall innovation.[39] NISA emphasizes on four major pillars to achieve sustainable innovation goals. The first is providing support for Australian entrepreneurs through increased access to investment sources, readiness for risk, and expansion on innovative initiatives and public research. The second is promoting cooperation among relevant industry groups and investors to find solutions to cope up with global challenges and to create jobs and economic growth. The third is developing and attracting potential talents for future global jobs. The fourth is serving as a model for innovation in government performance. In this regard, Australia defines innovation agencies that are responsible for the implementation of the country's core innovation strategic framework as follows.

1 Commonwealth Scientific and Industrial Research Organization (CSIRO)

Commonwealth Scientific and Industrial Research Organisation (CSIRO) is a state-owned innovation agency responsible for scientific research issues with the focus of advancing Australia's industrial potential that bring overall benefits to the country and commonwealth. CSIRO is also responsible for the skill training and education of research personnel as well as transferring science and technology knowledge to relevant sectors.[40]

CSIRO is an innovation agency that is very important to Australia's overall innovation strategy plan. Since 2015, CSIRO has been one of the most direct funded agencies from the Australian Government in accordance with the policy set under NISA.[41] Under the mentioned national agenda, CSIRO plays a pivotal role in bridging innovators and investors through establishing an innovation fund that supports the operation of high-technology industries and achieves in attracting investors to increase significant and necessary investments for future technology advancement.[42]

2 Innovation and Science Australia (ISA)

Innovation and Science Australia (ISA) is an independent agency comprising of entrepreneurs, investors, researchers and academics established as a nation's long-term strategic investment framework on innovation under NISA, and serves as one of the key organizations in driving Australia to achieve as innovation leader by 2030 or Australia 2030: Prosperity through Innovation through advising innovative policy for the government.[43] In this regard, ISA has released 30 innovative recommendations to the government, which can be summarized as five key strategic frameworks for Australia to develop their innovative potential by 2030 to guarantee competitiveness on the world stage as follows: 1) develop the education system in response to the rapidly changing workforce market by focusing on teaching students and undergraduates essential future skills, 2) ensure Australia's industrial strengths through supporting fast growing businesses and increasing productivity of the enterprises, 3) promote the role of government as a key driver in innovation creation and enhance the nation's image creation of being an innovation leader in the global service sector, 4) develop the efficiency of the research and development (R&D) system through the increment on the translation rate of researches and promoting researches in commercialization, and 5) promote culture and foster commitment to innovation creation at the national level through the formulation of National Missions on innovation.[44]

3 Rural Research and Development Corporations (RDCs)

In the case of the policy for the development of agricultural innovation, the Australian Government has focused on fund raising for innovation development in rural areas through the establishment of Rural Research and Development Corporations (RDCs) as well as funded US$ 157.4 million within 8 years to the Rural R&D Profit projects. This program is to ensure that Australian primary food producers are able to access to cutting-edge technology and applied research that will lead to continuous growth and productivity development, profitability, competitiveness, and sustainability of agriculture, fisheries, forestry, and food industries.[45]

The Australian Government has also received recommendations from Ernst & Young to create a joint vision of agricultural innovation system that will lead to the application of knowledge to strengthen competitiveness in the food and sustainable fiber industries through the five main guidance frameworks consisting of: 1) strengthening strategic leadership while fostering relations and cooperation among relevant sectors, 2) balancing fundraising and investments to cope with short-term challenges, 3) creating innovation approach to achieve global standards such as thinking out of the box and promoting entrepreneurial potential to ensure maximum benefits from investments, 4) strengthening at the regional level in self-innovation creating and fostering a greater role in the establishment of the national agenda, and 5) laying the foundation for future innovation through data management system, physical infrastructure building, and establishing legal system that facilitates innovation creation. The agricultural innovation vision report has been created to benefit all sectors involved in Australian agricultural innovation system such as researchers, RDCs groups, industry representatives, manufacturers, investors, government agencies, startup, etc.[46]

In the case of New Zealand (ranked the 25th), it can be said that apart from the role of the government sector, the private sector and the public sector play important roles in contributing to the development of a national innovation policy. In other words, in 2019, the New Zealand government has allowed groups of people and organizations to submit draft research, Science and Innovation Strategy, which has gone through a dialogue process, and become New Zealand's main innovation policy of focus on building a productive, sustainable, and ultimately inclusive.[47] Meanwhile, the New Zealand government focuses on fostered partnership with external organizations to promote cooperation and fund raising for research on science and innovation development within the country, industrial agencies or private companies. New Zealand defines major innovation agencies as follows.

4 Callaghan Innovation

Callaghan Innovation is one of the New Zealand government's most important tools for building strong and competitive economic foundation on the global stage through providing innovation assistance and guidance to the entire businesses covering small startup to large research and development businesses from the early stages of innovation. Callaghan Innovation plays a key role in networking of relevant sectors within innovation system, connecting similar industries, connecting business sectors to a network of technology experts, and connecting New Zealand with opportunities for conducting international business relations.[48] Callaghan Innovation also ties strong relations in developing a healthy innovative ecosystem with New Zealand Government and Crown Research Institutes (CRIs), which are described in the next part.

5 Crown Research Institutes (CRIs)

Crown Research Institutes (CRIs) are the governing agencies under New Zealand government with a joint shareholding of New Zealand Institute of Science and Technology and the Ministry of Finance. These agencies are primarily responsible for addressing the country's major challenges through

the productivity development and the capability to maximize sustainable resources in each sector. CRIs are also divided into seven sub-divisions with innovation accountability in different fields. 1) AgResearch is primarily responsible for empowering the agricultural sector heading to economic growth and positive results in environmental and social Benefits. 2) Institute of Environmental Science Research (ESR) aims to transfer knowledge, research, and scientific experiments to achieve innovation creation that facilitates the capacity in maintaining population healthcare, an economy rooted in food production, and natural resource preservation. 3) Institute of Geological Science and Nuclear Science (GNS Science) conducts research on the drive economy through land-derived energy and apply nuclear knowledge to develop industrial competence and protect the environment. 4) Landcare Research applies innovations in the care of biodiversity and surface resources. 5) National Institute of Water and Atmospheric Research (NIWA) is responsible for economic value creation, water resource management, and understanding creation and knowledge on sustainable climate response. 6) Plant and Food Research aims to value-added food production industry. 7) Scion aims at innovation development in the forest industry and the industries focusing on natural ingredients.[49]

6 New Zealand Food Safety Science and Research Centre

New Zealand Food Safety Science and Research Centre was established as a collaborative partnership among the government, industry organizations, and research institutes to integrate nationwide scientists to protect New Zealand consumers from food-related health threats, with a focus on raising the standards of New Zealand's food production to recognize and create a positive image on the world stage. In addition to the financial support from the private food sector, the agency has also received financial support by Ministry for Primary Industries.[50]

Case Studies of Innovation in the America, Africa, and Antarctica

1 The Americas: United States of America and Chile

In the case of North America, the United States of America (ranked the 3rd on the World Innovation Index) has long been at the forefront of innovation in the world, with American business sector as a key player in driving the development of high technology into the world market. The Bureau of Economic and Business Affairs is a key organization in the close co-operation of innovation between public and private sectors of the United States of America to strengthen the government insights into modern technology leading to policy action and dialogue that preserve the US's potential to be the innovation leader in the world market.[51] In addition, the United States of America with the support of the Department of Commerce, Department of Defense and Department of Energy has created the National Network for Manufacturing Innovation (NNMI) or Manufacturing USA, a collaborative innovtion network in various fields between 14 innovation agencies such as the 3D printing National Additive Manufacturing Innovation Institute (America Makes), Smart Manufacturing Innovation Institute, National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL), etc.[52]

In the case of the South America and the Caribbean region, Chile (ranked the 51st on the World Innovation Index) is one of the most innovative countries, and is the South American country where Thailand has previously established innovation relations. One of Chile's key innovation agencies is the Chilean Economic Development Agency (CORFO). CORFO plays a key role in driving the entrepreneurial, innovative and competitive potential of the national economy. CORFO has undertaken programs to incentivize

and support innovative entrepreneurs with a focus on development in each field, and also emphasizes on providing support that is in line with the size and needs of startup.[53]

2 The Africa: South Africa

South Africa (ranked the 63rd country on the World Innovation Index) is the country with the best innovation performance in the Sub-Saharan Africa region. The Technology Innovation Agency (TIA), established by Science and Innovation Department, Republic of South Africa, plays a key role in driving the country's innovative talents. The TIA, a public national entity, aims to apply national knowledge resources for sustainable economic and social development by providing technology development support in the form of comprehensive funds covering the initiatives and the creation of commercial technology.[54]

3 The Antarctica: Antarctic Treaty System (ATS)

Although the Antarctica is the only continent in the world that does not have permanent inhabitants and is made up of the entire ice sheet. Twelve countries (Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, Russia, United Kingdom and the United States of America) with scientific interests maintain their staffed research stations on the continent under the Antarctic Treaty which became effective in 1961 to establish a framework for international cooperation in the peaceful use of space on the basis of freedom to explore, observe, coordinate cooperation, and share scientific knowledge among the parties.[55] Scientific research is currently the main activity taking place in the Antarctica under the Antarctic Treaty. They also coordinate the collaboration of the Scientific Committee on Antarctic Research (SCAR) and the Council of Managers of National Antarctic Programs (COMNAP) to frame scientific cooperation and joint operations in telecommunication, meteorological, transport, and other areas critical to research projects in the area.[56]


United States of America
Bureau of Economic and Business Affairs
National Network for Manufacturing Information (NNMI)
National Additive Manufacturing Innovation Institute
Smart Manufacturing Innovation Institute
National Institute for Innovation in Manufacturing Biopharmaceuticals
United Kingdom
UK Research and Innovation (UKRI)
Innovate UK
Nesta
ASEAN
ASEAN Plan of Action on Science, Technology and Innovation (APASTI)
ASEAN Innovation Roadmap 2019-2025
ASEAN Science and Technology Network (ASTNET)
Japan, China, South-Korea
Singapore
Agency for Science, Technology and Research (A*STAR)
Economic Development Board (EDB)
Malaysia
Ministry of Science Technology and Innovation
Ministry of Higher Education
Europe
Innovation Union
Horizon 2020
European Research Area (ERA)
Protocol 31
Chile
Chilean Economic Development Agency (CORFO)
Australia
Australian's National Innovation and Science Agenda (NISA)
Innovation and Science Australia (ISA)
Rural Research and Development Corporations (RDCs)
South Africa
Technology Innovation Agency (TIA)
Antarctica
Scientific Committee on Antarctic Research (SCAR)
Council of Managers of National Antarctic Programs (COMNAP)
New Zealand
New Zealand's Callaghan Innovation
Crown Research Institutes (CRIs)
New Zealand Food Safety Science and Research Centre

Strategies by Continents in the Fiscal Year 2021-2024

Part 4

First Strategy:
Innovation Diplomacy with European Countries

The Second Strategy:
Innovation Diplomacy with Asian Countries

Third Strategy:
Innovation Diplomacy with Countries in the Australian Continent

The Fourth Strategy:
Innovation Diplomacy with International Organizations

Overview of the Strategic Proposal of the Innovation Diplomacy in the Fiscal Year 2021-2024

Strategies by Continents in the Fiscal Year 2021-2024

Strategies on Innovation Diplomacy over the next three fiscal years (2021-2024) will be based on three factors, which are described as A) the National Strategy (2018-2037), B) Global Innovation Index by WIPO, and C) the innovation strategy of relevant key countries and regions mentioned in the text; Part 3. NIA found that Thai innovation development through Innovation Diplomacy must contain strategies representing the consistency of all three strategies as follows.

The 20-year National Strategy, which came into effect in 2018, outlined the country's development in six strategic areas: stability, building competitiveness, developing and empowering human resources, creating opportunities and social equality, growing on environmentally friendly quality of life as well as balancing, and the development of governmental administrative system, which are directly and indirectly related to Innovation Diplomacy.

Global Innovation Index, the innovation indicators are considered in two areas: A) the input environment that facilitates the innovation development consists of 1) institutional factors including the political environment, the rule of law, the environment being conducive to the business commencement and operation, 2) human capital and research factors including the basic education system, higher education system, research and development, 3) infrastructure factors including information technology, public physical infrastructure, and environmental sustainability, 4) market system factors such as the amount of funds for transactions, investment conditions, domestic markets, and international trade treaties, and 5) business

promotion factors including the numbers of skilled workforce, the link between the business sector and knowledge with the innovation and knowledge development together with innovation and knowledge perception.

B) The output factors used in the indexation are 1) factors for knowledge creation and technologies, including the knowledge generation (e.g. patents), sequences of knowledge, and broad distribution of knowledge, and 2) creativity factors including intangible assets, product exports, innovative services, and creative products on online platforms (e.g. applications on smartphones).

Considering the 20-year National Strategy in conjunction with the Global Innovation Index, the consistent goals are displayed as shown in Table 4.1.

Table 4.1

Relations between the National Strategy and the Global Innovation Index

		National Strategy					
		Security	Competitiveness	Human resources	Opportunity and Equality	Environment	Public Administration System
Global Innovation Index	Institutional factors	√	√		√		√
	Human Capital and Research		√	√		√	
	Infrastructure	√	√		√	√	
	Marketing System		√				
	Business Promotion		√	√	√		
	Building Knowledge and Technology		√				
	Creative Economy		√				

The above consistency reveals that the national strategies and the national innovation from the Global Innovation Index are coherent. Furthermore, the national strategies need to add on is that there is no precise action plan that relates to innovative outputs such as knowledge and technology creation, and the outstanding creative economy. The competitiveness building strategic plan is a comprehensive plan covering both infrastructure and innovation. In details, it reveals that this strategic plan does not yet cover the indicators related to knowledge creation and knowledge base distribution which the previous Innovation Diplomacy guidelines and activities can fulfill this part very well.

As a result, NIA's goal in promoting Thailand as the world's leading innovation nation must be based on Innovation Diplomacy, hosted by NIA, to create a cooperation between Thailand and leading innovative countries in order to attract government agencies (G2G) and private sector (G2I and G2S) in leading innovative countries to conduct economic activities and jointly develop the innovation through the transfer and exchange of knowledge as well as innovation with the countries where Thailand has built these relations. This results in the effectiveness toward the national strategy as well as building credibility through the ranking of global innovation nation.

Therefore, the development of the Innovation Diplomacy relations over the next three fiscal years is based on the continent strategies that should focus on the development of the first three urgent relations. The development is determined as 1) the ranking of world-leading innovation nation, 2) the development on the basis of original Innovation Diplomacy relations, and 3) the consistency between the National Strategy (2018-2037) with the existing strategy in each continent (Diagram 4.1). The strategies for the next three fiscal years during 2021-2024 include Innovation Diplomacy with European countries, Innovation Diplomacy with Asian countries, Innovation Diplomacy with the countries in the Australian Continent, and Innovation Diplomacy with international organizations.

First Strategy:
Innovation Diplomacy with European Countries

Europe is an area where Thai state should have a short-term or three-year strategy as first priority based on three factors. First, more than 30 European countries (27 European Union members and European Union partners such as Norway, Switzerland, Iceland, Liechtenstein, and Serbia) have been integrated with harmonized Innovation Policy under the European Commission, the European Union, and Protocol 31 of the Agreement on the European Economic Area (EEA).* Second, in the ranking of world innovation nation (see Table 2.1), more than 10 leading innovative European countries are recorded (Switzerland, Sweden, the Netherlands, England, Finland, Denmark, Germany, Ireland, France, Luxembourg, Norway, and Iceland). Third, in the case of the United Kingdom (the world's fifth leading innovation nation), it has passed over EU membership and its EEA contract since January 31st, 2020. The United Kingdom is still in a transition phase and will continue to be bound by international agreements defined by the European Union, including EEA in the use of the innovation policy as an EU partner until December 31st, 2020 in accordance with Article 126 of the United Kingdom Withdrawal Agreement and is likely to extend the transitional period.

The implementation of innovation cooperation with Europe is primarily a relation through the European Union's innovative strategy structure. The European Union's supranational nature allows NIA to reduce the cost of conducting its activities by country, obtain a single agreement or cooperation while the implementation can be conducted immediately to member states across the European Union. In addition, the European Union has a strategic

*EEA is a mutual agreement among the European Union member states and the European Free Trade Area (EFTA) member states including Iceland, Liechtenstein and Norway (except Switzerland) in expanding the scope of the European Common Market that guarantees equal marketing rights under common rules to include European non-EU countries by being an "Internal Market" to promote the free movement on workforce, goods, services and capital in the aforementioned countries.

plan and agencies to develop union innovation cooperation of the Union and build a hub for innovation transfer among member states and other alliances in the private sector as the Innovation Union, Horizon 2020 and European Research Area (ERA). In the case of non-European Union alliance countries, NIA can take advantage of European Union and the countries innovation relations agreement with the European Economic Area (EEA) countries in accordance with Protocol 31.

However, this strategic plan needs to allocate a portion of resources to foster the Innovation Diplomacy cooperation with the United Kingdom after the official release from the European Union. It reveals that the United Kingdom has innovative agencies and strategies that NIA can network together, including UKRI, Innovate UK, and Nesta, which the networking with these strategic plans and agencies will provide a comprehensive Thai innovation network with the innovation network in Europe.

The proposal on Innovation Diplomacy with Europe in the fiscal year 2021-2024 are detailed in Table 4.2 as follows.

Table 4.2

Innovation Diplomacy Projects with European Countries 2021-2024

Group / Country	Institutions	Activities	Indicators
European Union	European Commission	Building cooperation among Thai innovation agencies such as the Ministry of Higher Education, Science, Research, and Innovation, or NIA with European Commission.	MOU
		Preparing project proposals to collaborate on innovation in EU-focused research projects under the Horizon 2020 Research Strategic Plan and ERA	Innovation Initiative Collaboration Agreement

Group / Country	Institutions	Activities	Indicators
	Innovation and Networks Executive Agency	Preparing project proposals for innovation cooperation in research projects that the European Union is highly aware of environmental focus in accordance with the research strategy plan on Innovation Fund.	Cooperation Agreement on Environmental Innovation Program
United Kingdom	UKRI	Strengthening cooperation and exchanging knowledge on innovation with UKRI.	MOU

The Second Strategy:
Innovation Diplomacy with Asian Countries

The past development of innovation diplomacy activities reveals that the relations building operation in Asia, both quantitative and qualitative, has been carried out in the right direction, especially being tied with the major innovative countries, China and Japan, through the establishment of NIA relations and main innovation agencies such as the CATTC of China, NEDO and Knowledge Capital Association of Japan, etc. In addition, It ties the innovation relations with South Korea, considered the world's top innovation nation (ranked the 11th in the world, the 2nd in Asia), as well as being a leading research and development country with the Korea Advanced Institute of Science and Technology (KAIST), as the main institute in the leading innovation creation of the country and the world. Therefore, over the next three years, NIA will continue to build further diplomatic and innovative network tied with South Korea at all three levels: G2G, G2I, and G2S, with the support provided by the Ministry of Foreign Affairs, Royal Thai Embassy in Seoul, and Korean-Thai Chamber of Commerce.

At the same time, the ASEAN Plan of Action on Science, Technology and Innovation (APASTI) 2019-2025 and ASEAN Science and Technology Information Network (ASTNET) have been implemented. These are plans to link and transfer knowledge in science, technology, and innovation among 10 member countries, as well as expanding the cooperation framework to key negotiating countries such as ASEAN+3 (China, Japan, and South Korea), ASEAN+6 (China, Japan, South Korea, India, Australia, and New Zealand), which will group together the leading innovation nations in both East Asia and the Australian Continent in the network. In addition, NIA is able to take advantage of the plans related to innovation so that Thailand can immediately acquires and transfers knowledge on innovation through the framework of cooperation. The project proposals on Innovation Diplomacy with Asia in the fiscal year 2021-2024 are detailed in Table 4.3 as follows.

Table 4.3

Innovation Diplomacy Projects with Asian Countries

Group / Country	Institutions	Activities	Indicators
ASEAN	Innovation Agencies of ASEAN Member States	Support and cooperate with the Ministry of Higher Education, Science, Research, and Innovation in building a cooperation network and exchanging knowledge on innovation through the ASTNET network according to the Cabinet Resolution 2019.	Network of Cooperation with ASEAN Member States.
South Korea	Korea Advanced Institute of Science and Technology (KAIST)	Encourage cooperation between NIA and Thai universities or innovation institutes with Korea Advanced Institute of Science and Technology (KAIST) as the starting point for further cooperation in the future.	MOU between NIA and / or universities and KAIST.

Third Strategy:
Innovation Diplomacy with Countries in the Australian Continent

Innovation Diplomacy with the countries in the Australian Continent is of third importance based on three factors: The past Innovation Diplomacy activities between Thailand and the Australian Continent, geographical distance, and the advance agricultural innovation of the countries in the Australian Continent, especially Australia and New Zealand. Both countries have clear strategic plans for innovation and have direct agencies responsible for thematic advance. Australia establishes Rural Research and Development Corporations (RDCs), which develops local innovations. This agency will assist the people in rural areas to improve the competitiveness and the sustainability of agricultural industry, fishing industry, forest industry and food industry. These are issues related to the local development approach of Thailand to reduce the concentration of population in urban areas and widen the development to generate the incomes to the people in localities across the country. At the same time, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) also supports funding and cooperation in research projects such as agriculture, industry, environment, etc., in line with Thailand's national strategy.

The government agency of New Zealand provides clear and comprehensive structure of innovation activities under Callaghan Innovation, which supervises and assists the innovation development of New Zealand private sector as well as the international relations. Establishing a network that connects the framework with NIA through Innovation Diplomacy enables Thailand to exchange knowledge and innovation with New Zealand effectively, especially the expertise on environment of Crown Research Institutes (CRIs) and the innovation on food industry of the New Zealand Food Safety Science and Research Centre (NZFSSRC).

The project proposal on Innovation Diplomacy with the Australian Continent in the fiscal year 2021-2024 is detailed in Table 4.4 as follows:

Table 4.4

Innovation Diplomacy Projects with the Countries in the Australian Continent 2021-2024

Group / Country	Institutions	Activities	Indicators
Australia	Rural Research and Development Corporations (RDCs)	To build the cooperation between NIA and RDCs to exchange knowledge on rural development, agriculture, and agricultural industry, which is in line with the development guidelines of Thailand's 20-year National Strategy.	MOU, G2G Model
	Common-wealth Scientific and Industrial Research Organisation (CSIRO)	To establish proposals for research and innovation projects such as environment, agriculture and food industry, renewable energy, etc.	Cooperation Agreement on Environmental, Agriculture, and Renewable Energy Projects
New Zealand	Crown Research Institute (CRIs)	To build the cooperation between NIA and CRIs to exchange knowledge on climate change and the impacts on agriculture.	MOU
	New Zealand Food Safety Science and Research Centre	To build the cooperation between NIA and the Food Safety Science and Research Centre to exchange knowledge on food technology and consumer safety.	MOU

The Fourth Strategy:
Innovation Diplomacy with International Organizations

Since 2018, NIA has signed a cooperation on social innovation with the United Nations Development Programme (UNDP). The signing aims to drive innovation networks in the public and private sectors, as well as to support the Regional Innovation Center in Thailand as a regional innovation business development hub in Indochina, linking with Cambodia, Laos, Myanmar, and Vietnam. Organizing the Southeast Asia Startup Assembly (SEASA) in 2020 marks a milestone for NIA in promoting Thailand to be a hub of exchange and building startup ecosystem under the theme of "Advancing Partnership for Sustainability" (partnership, advancing and sustainability) and announced the "Bangkok Startup & Innovation Declaration" together with ASEAN members and partners in 12 countries.

The implementation of the Innovation Diplomacy strategy of NIA with international organizations over the next three years will focus on the development of existing collaboration and seek the cooperation with international organization innovation programs such as ETIFE of the World Bank, which assesses and helps countries develop the innovation connection among small entrepreneurs in the country. In addition to spreading Thai innovations to the global community, NIA will seek the cooperation with Organisation for Economic Co-operation and Development (OECD) projects in the Observatory of Public Sector Innovation (OPSI), a project that provides innovative case studies of various government agencies that raise awareness of the advancement of Thai innovations in the global community.

NIA also strives to act as a bridge in innovations between Thailand and other important international organizations in the future to enable the innovation development leading to the creation of an innovative economy system in line with the major international economic proposals such as the World Bank and the International Monetary Fund.

The project proposals on Innovation Diplomacy with international organizations in the fiscal year 2021-2024 are detailed in Table 4.5 as follows.

Table 4.5

Innovation Diplomacy Projects with international Organizations 2021-2024

Group / Country	Institution	Activity	Indicators
UNDP	Regional Innovation Center	Continuing the cooperation on innovation in the Indochina region to support Thailand as an innovation center for development in the region.	Innovation network and innovation projects supported by UNDP
World Bank	Firms, Entrepreneurship and Innovation Unit (ETIFE)	Creating the cooperation and seeking to support knowledge in financial innovation and SMEs business operation	MOU or international agreements
OECD	Observatory of Public Sector Innovation (OPSI)	Presenting case studies on innovation of Thai government to demonstrate the advancement and competence of Thai innovations on the world stages	Annual reports presenting the innovation advancement

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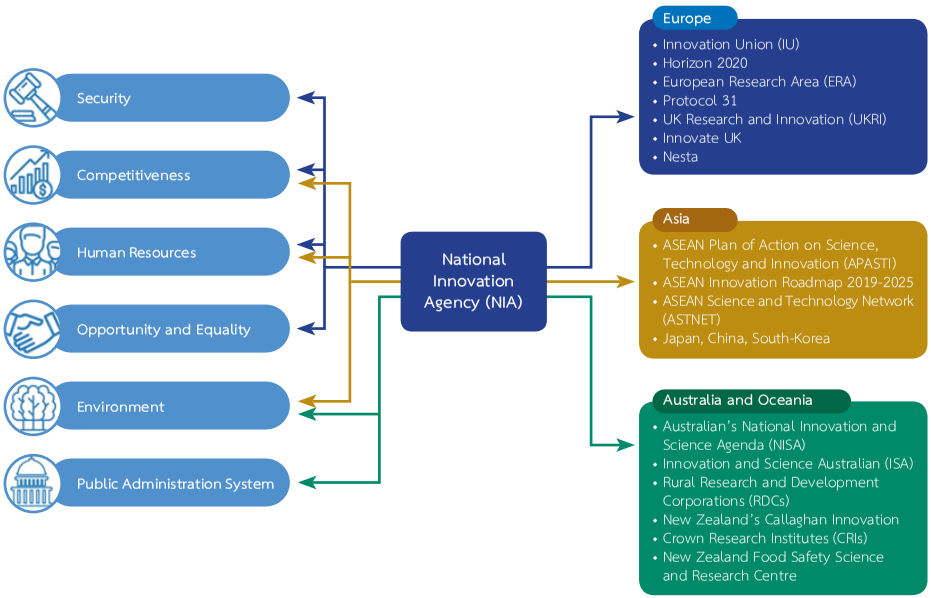
When considering the continent strategies and international organizations, it reveals that creating a network of Innovation Diplomacy with leading innovative countries across three continents, international organizations, and innovative collaborations with countries in North America, South America, the Africa, and the Antarctica can create opportunities for acquiring and exchanging knowledge on innovation among Thailand with various countries in the networks or international organizations. Having an efficient network

will drive Thailand to become the world's leading innovation nation, especially with the import and export of knowledge that different countries and departments with different expertise will assist Thailand to achieve the response to the national development according to the 20-year national strategy and directly affect the better ranking in the Global Innovation Index of Thailand at the same time.

An overview of Innovation Diplomacy strategies of NIA over the next three fiscal years is summarized in Diagram 4.1, which shows the relations between the foreign innovation strategies and the Thai national strategies, where NIA acts as an intermediary for the exchange of knowledge and innovation between Thailand and the global innovation network. It can be seen that the European Innovation Strategies are related to the national strategies on security, competitiveness, human resource development, and the issues of creating opportunity and equality in society. The innovation strategies of Asia focus on building national competitiveness, developing a highly skilled workforce, and building a sustainable economy. The Australian Continent focuses on environmental issues and the development of public administration, as well as developing the existing cooperation with international organizations and seeking new cooperation. When Thailand is able to exchange expertise and knowledge and innovations in line with the national development strategies with NIA as an intermediary through NIA personnel and integration with government and private sectors, and having clear strategic plans leading to be implemented, Thailand will be able to take advantage of Innovation Diplomacy to drive Thailand to become a leading innovation nation in ASEAN and the world as well.

Diagram 4.1

The Link between Innovation Diplomacy and National Strategy



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INNOVATION DIPLOMACY

The Kingdom of Thailand is a leading innovative nation that has implemented the Innovation Diplomacy as an effective mechanism in tackling with the regional and global challenges.

National Innovation Agency (Public Organization) as the anchorman of Innovation Diplomacy has driven for the network relations all over 30 countries across the world.