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China's Presence in International Science and Technology Activities

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This report is compiled as part of a research that surveyed and analyzed science and technology innovation policies, research and development trends, and associated economic and social circumstances in the Asia-Pacific region. It is being made public on the APRC website and portal site to enable wide use by policymakers, associated researchers, and people with a strong interest in collaborating with the Asia-Pacific region; please see the websites below for more details.

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Executive Summary

China has been remarkably active in scientific and technological activities, as evidenced by the number of papers published, and is said to have a growing presence in international scientific and technological activities. This survey aims to gain a factual picture of these activities.

Since the Xi Jinping administration came to power, China has strengthened its active involvement in the reform of the global governance system and has made remarkable moves to expand its presence in science and technology activities. On the other hand, there is no survey that provides a complete picture of China's international science and technology activities. In this survey, we attempted to systematically organize as much as possible the facts of China's international activities in the five fields of scientific journals, international conferences and conventions, international organizations, international projects, and institutions of higher education.

In conducting the survey, we took into account the special characteristics of science and technology, while referring to some of the previous surveys. In other words, while science and technology can directly lead to the strengthening of a country's economic and military power, which in turn strengthens its voice in international politics, the international community as a whole benefit when the results of research and development through competition and cooperation are shared not only among the countries concerned, but also internationally. In this sense, while there are similarities with the economy, where mutual benefit and competition coexist through trade, it is different in character from the military. In other words, it can be said that China is making a certain contribution to the international community through its active international scientific and technological activities.

In organizing the facts, we have reviewed the basic policies of the policy documents issued by the Communist Party of China (CPC) Central Committee, the State Council, and other relevant government departments, and have focused on specific activities being promoted by the National Natural Science Foundation Commission (NSFC), the Chinese Academy of Sciences (CAS), the Chinese Association of Science and Technology (CAST), and prominent universities based on these policies.

The characteristics of China's presence in international scientific and technological activities can be summarized as follows.

In scientific journals, activities to become an international scientific journal have been actively developed in recent years, partly due to state-led policies, but there is still a need to raise the level of attention of researchers around the world. We cannot take our eyes off the trends until 2035, which is the target to be achieved in order to become the world's No. 1 scientific journal in terms of overall strength. On the other hand, there is a clear presence in the number of editors and others in the world's major journals, and it can be said that Chinese researchers are gaining a higher reputation.

- Although a broader survey is needed for international conferences and conventions, activities within the framework of Belt and Road Initiative, etc. stand out, and it will be interesting to see whether these activities will go beyond this initiative to involve a wider range of countries and regions.

- As for international organizations, the number of specialized United Nations agencies headed by China is not as large as it was at one time, but the formation of relationships with countries and regions through cooperative activities for the Belt and Road Initiative is expected to have an impact, and further analysis and evaluation is important. It is also necessary to look at trends in the number of staff, the scale of financial support, and the countries that benefit from it.

- It can be said that international projects are also enthusiastic about human resource development centering on the Belt and Road Initiative. While active participation in large-scale international projects, such as the International Thermonuclear Experimental Reactor (ITER) project, can be confirmed, the country is also developing its own activities in space development, including the construction of a space station.

- International activities related to institutions of higher education have developed in China due in part to its unique historical background, but there has been a recent trend in Europe and the United States toward Sino-foreign universities (universities that provide higher education mainly for Chinese citizens in China, with cooperation between Chinese and foreign educational institutions. This includes a small number of joint universities outside of China), and Confucius Institutes (China's first international university in the world) in the West.) and Confucius Institutes (Chinese language and culture-related educational institutions established by China in partnership with universities and other institutions around the world), and it has become more difficult to achieve the original goal of exerting influence in areas such as Chinese language education and cultural exchange.

Taking the initiative by enhancing one's own presence internationally in various fields, including science and technology, means having the power to set various agendas based on certain values in those fields. This will also lead to the establishment of national and economic security under the initiative of the country itself. In this sense, any country will naturally aim to expand its presence, backed by a certain level of scientific and technological capabilities. Of course, this requires the presence of a certain level of competence.

Not to mention the example of the U.S.-led Japan-U.S. Educational Exchange Foundation (commonly known as the Fulbright Foundation), it can be said that the development of talented foreign students and researchers and the establishment and development of one's own cultural and economic sphere are in a sense one and the same, and the significance of such activities is probably the same regardless of the country or time period.

We could not know what the outcome of China's growing presence in international scientific and technological activities would be. However, looking at the recent conflicts between the U.S. and China which has been evolving over differences in values, it is necessary to be careful in seeing the future of the conflict, but for the time being, it is important to sort out the facts first.

In any case, we hope that the facts gathered in this survey will be further enriched and utilized in future analyses and evaluations.

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1 Introduction

(1) Why China's presence is focused on?

In contrast to the values of freedom, democracy, human rights, and the rule of law that the United States and other so-called Western countries have espoused since the end of World War II and the Cold War, China is engaging in all of its activities with a policy of making its own unique contributions to global governance in line with its own values to realize a strong and modern socialist country. The conflict between the United States and China has escalated to the level of technological and research friction, and both countries have developed a variety of countermeasures against each other.

Although this situation will not be further discussed in this report, it is important to grasp the facts as broadly and deeply as possible and, if possible, to have sufficient materials to understand the meaning of these movements, not in the military, diplomatic, economic, and other fields where they are evident, but in the academic, scientific, and technological fields where they can be considered soft power.

Historically, many developed countries, including Japan, have pursued moves to strengthen and expand their presence in scientific and technological fields and to secure international initiatives, so it cannot be said that such moves are unique to China. In a sense, it is natural for China to take the initiative in the international arena, and this type of initiative is required of any country, regardless of the era.

However, in recent years, as China has become more active with such movements in these areas of culture, academia, and science and technology, some Western countries have become concerned about this as an unwelcome foreign influence, and it is also widely known that, in some cases, these western countries have taken a countervailing stance. There is no doubt that the international circulation of knowledge brings progress to humanity, but conflicts like this have a practical effect on exchanges amongst researchers and can even result in obstructing cooperation that is aimed at resolving issues that are essentially common to all of humanity. Are China's moves more of a cause for concern that promoting the development of science, technology, and academia?

In order to answer these various questions, it is first and foremost important to observe China's presence in international science and technology activities and to lay out the facts that represent its current situation. As such, this report will summarize the facts of how China's policy goals are being embodied in specific science and technology-related international situations.

Based on this, the authors hope to show how international initiatives in science and technology that should be taken by a single country will be evaluated, and how the aforementioned concerns and their impact on exchanges will be seen.

(2) Prior studies

There is much research and literature on the initiatives that China has been demonstrating in the international arena.

One such study is Part III ("China's Presence in the International Community") of "Three Elements for Understanding Contemporary China: Economy, Technology, and International Relations," which was edited by

Kawashima Shin of the 21st Century Public Policy Institute. The discussion most relevant to this report is Chapter 6, "China and the International Order" by Rumi Aoyama. Prof. Aoyama argues that China launched its Belt and Road Initiative and is actively developing diplomacy centered around the pillars of institutional hegemony, economic hegemony, political and ideological hegemony, and military hegemony. She also addresses issues related to science, technology, and innovation, such as the United States' restrictions on procurement by Chinese high-tech companies, particularly Huawei.

In the aforementioned Part III ("China's Presence in the International Community"), Chapter 7 by Naohiro Kitano discusses "The Current Status of and Challenges for China's Foreign Aid" by. Of note is China's participation in the Junior Professional Officer (JPO) dispatch system, which is often considered to be a gateway to success for UN staff; China's dispatch of more than 500 interns to international organizations, including to the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Office of the High Commissioner for Refugees (UNHCR); and China's dispatch in 2019 of university student volunteers to international organization offices in countries along the Belt and Road Initiative based on a memorandum of understanding between the Chinese Young Volunteers Association (CYVA) and the United Nations Volunteer (UNV) program. Through these activities, it is clear that the Chinese government is stepping up its efforts with the aim of increasing the number of Chinese-born UN staff over the long term.

In any case, no detailed study has yet been conducted into how these Chinese moves are being developed in the international arena of science and technology activities.

A book that was recently published in Japan, "How Does China Use Its Power?: Power that Sustains and Increases China's Dominance and Development" (edited by Tomoki Kamo), has kindled widespread awareness of the issue. According to the book, as a great power, China needs "power," but this "power" is defined as "not only economic power and military power, but also the power to clearly embed China's will (in terms of policy making and policy execution) into international organizations and the systems that shape the international order." The book highlights the health care, agricultural, and anti-poverty measures for developing countries that are actively being promoted by Xi Jinping's leadership. It further claims that China is shifting from a "state that adapts to situations" and into a "state that creates situations."

The final chapter of the book looks at the question of "How will China use its power as a great power?" In it, Masaaki Yatsuzuka asks the question "How will China, a 'science and technology great power,' use its power?" and then conducts an investigation that is similar to the issue being addressed in this report. Yatsuzuka's discussion begins with the usual entry point that is used when discussing China's science and technology: its research and development budgets and its number of researchers. He also discusses China's remarkable technological achievements, such as 5G, and the current state of conflict between the United States and China that has resulted from those achievements, with a particular emphasis on the development of military technology. Of particular interest is that China emphasizes "strategic high points" in science and technology. In response to the above question, Yatsuzuka's first answer is "management of technology-related trade and investment" and the second is "China's influence on international standardization." Yatsuzuka introduces that, since around 2018, China has been promoting the "China Standards 2035" strategy, has been actively involved in international standardization activities centered around the International Organization for Standardization, and has begun to exercise strong influence in seeking the adoption of its own technical standards. The third point that he discusses is "China's influence on international norms, which are formed

as emerging technologies change the security environment," and points out that China's involvement in the Geneva Conference on Disarmament and other forums should be noted. Yatsuzuka summarizes by emphasizing, "Now that China has emerged as a great power in these issues, based on that recognition it is gaining the power to present alternative plans to the international community and to have such plans accepted, especially by developing countries."

As for the "international standards" mentioned by Yatsuzuka, it is said that the number of Chinese executives and number of proposals at standards organizations have been on the rise in recent years, which indicates interesting developments that closely resemble those discussed in the academic, scientific, and technological fields covered in this report. However, the activities that this report focuses on are also those that are more familiar to the average researcher, namely, how China is using its "power as a great power" by focusing on its various activities in academia, science, and technology. This is also perhaps an area that has not yet received sufficient analytical scrutiny.

The particular characteristics of science and technology should be taken into account when looking at the initiative amongst major countries. In other words, while science and technology are directly linked to strengthening the economic and military power of the country that brought about the results, and thus to strengthening that country's voice in international politics, science and technology also have an aspect in that the international community as a whole benefits from the sharing, both domestically and internationally, of research and development results through competition and cooperation. In that sense, although science and technology have similarities with economic power where mutual benefit and competition coexist through trade, they have a different character from military power. That is to say, it can be seen that China is making a certain level of international contributions by invigorating scientific and technological activities.

Considering the current state of previous studies and of the particular characteristics of science and technology as described above, the authors believe that it is important to conduct research to ascertain the facts regarding China's international presence in science and technology activities because doing so provides basic information for further discussions in the future.

2 China's Policies on International Science and Technology Activities

(1) Basic policies and direction

This report first investigated what basic policies and specific directions the Chinese Communist Party (CCP) and government have regarding initiatives that China should take in international science and technology activities.

Many of the CCP's policy documents are announced after meetings at various party headquarters, and their content is wide-ranging. In China, after relatively free discussions in academic and industrial circles, once a certain direction has been indicated at the core of the CCP or at the central government under the leadership of the CCP, the relevant agencies and bureaus of each department and local government at each level tend to develop specific activities that are in line with that direction under a certain flexible interpretation, as if they are competing for results. The starting point for this report will be to confirm what kind of policies related to international presence have been taken since before and after the Xi Jinping administration, which began to particularly strengthen China's science, technology, and innovation policies.

1. Basic policy documents

This report will first take a look at documents that express the basic idea of seeking a Chinese presence in international activities related to science and technology. After that, there will be a review of some basic policy documents presented both before and after the inauguration of the Xi Jinping administration (see the references at the end of the report). Policy documents that are quite specific will also be quoted in the descriptions for each item.

(A) Statements by General Secretary XI Jinping

General Secretary Xi Jinping held the "12th Collective Study Session of the 18th Politburo of the CCP Central Committee" on December 30, 2013 after assuming the office of President, with the speech listed as "Building China's soft power."[1]

This speech emphasized the importance of "building China's soft power" and called for "promoting advanced socialist culture," "strengthening the cultural and creative vitality of the Chinese nation as a whole," and "promoting the rapid development of the cultural industry." It also called for "valuing creating an image of China" and "focusing on presenting the image of a great power that can contribute to humanity," as well as "improving China's ability to communicate externally," "the careful construction of a foreign language system," "improving creativity, inspiration, and trust of foreign languages," and "skillfully conveying China's stories." In this speech, there are no particular mentions of science, technology, or academia. However, at the end of the speech, he states that the government will

[1] Refer to Xi Jinping, "Discussing the Management of the National Government," p. 176.

"focus on promoting" ... "the outstanding culture and flourishing history of the Chinese people and the Chinese nation" and will "utilize various methods such as 'school education, theoretical research, and historical research,' etc." In this context, it is to be expected that China would increase its influence in international science and technology activities.

(B)National Medium and Long-Term Plan for the Development of Science and Technology (2006-2020) (MLP)

The International Science and Technology Cooperation section of the MLP advocates for the following:[2]

- Expanding international cooperation with foreign countries
- Actively participating in international scientific projects and academic institutions
- Helping Chinese scientists assume leadership positions in important international academic institutions
- Encouraging multinational companies to establish research institutes

(C)National 13th Five-Year Plan for S&T Innovation

Published in July 2016, with regards to international cooperation, the plan calls for the following:

- In addition to promoting international cooperation with the relevant regions related to the Belt and Road Initiative, "promoting science and technology infrastructure interconnectivity"
- Thorough participation in global innovation governance as full integration of innovation networks, and accelerating and actively establishing the construction of large-scale scientific research infrastructure around the world.[3]

(D)Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035

Published in March 2021, with regards to science, technology, and innovation, the plan calls for the following policies related to international activities:[4]

- "implement a more open, inclusive, mutually beneficial, and shared international strategy for cooperation in science and technology and more actively integrate ourselves into the global innovation network"
- "pragmatically promote international cooperation in the fields of global epidemic prevention and control and public health, boost joint research and development with researchers from various countries focusing on climate change, human health, and other issues"
- "take the lead in designing and initiating international big science programs and projects, and give play to the unique role of science funds" (does this mean that China will utilize the unique functions of science funds, or that China will allow science funds to play a unique role?)
- "step up the opening-up of the national science and technology programs, launch a group of major science and technology cooperation projects, explore and establish a global research fund, and implement scientist exchange programs"

2 Refer to: https://spc.jst.go.jp/policy/downloads/aprc-fy2022-pd-chn01.pdf

3 Refer to: https://www.nedo.go.jp/content/100903934.pdf

4 Refer to: https://spc.jst.go.jp/experiences/beijing/bj21_023.html

- "support the establishment of international scientific and technological organizations in China, and welcome foreign scientists to serve in scientific and technological academic organizations in China"

Looking at the developments listed above, it is repeatedly stated that China will participate in international projects, that China itself will proposal and establish projects, and that China will promote the personnel participation in international organizations. In particular, "establish a research fund for the world" as listed here in the 14th Five-Year Plan is a new direction and will be a focus of attention in the future.

(E)Some Considerations for Deepening International Science and Technology Cooperation in the New Era (Department of International Cooperation, Ministry of Science and Technology of the People's Republic of China, September 2022)

These considerations were presented in the September 2022 issue of China *Scitechnology think tank*, a monthly magazine published by the Chinese Academy of Science and Technology for Development, a think tank under the Ministry of Science and Technology, in a special feature entitled "Open Innovation and International Science and Technology Cooperation."[5]

The following interesting policies are presented:

- Fully integrate into global innovation networks through a top-down design
- Build science and technology diplomacy and develop multi-layered and focused international science and technology innovation strategies in all directions
- Respond to international innovation governance being brought about by emerging technologies and take the lead in establishing new international rules
- Actively support increasing China's standing and influence in the international scientific community
- Communicate the story of China's science and technology innovation in language that is acceptable and understandable to the international community (author's note: narrative)

2. Primary implementing agencies responsible for China's international presence in science and technology related organizations (such as the National Natural Science Foundation of China) and their activity policies

This report focuses primarily on the National Natural Science Foundation of China (NSFC), the Chinese Academy of Sciences (CAS), and the Chinese Association for Science and Technology (CAST) as implementing organizations, introducing both their missions and their policies that are primarily related to international science and technology activities.

If the policies of each implementing agency are kept in mind, then it can be seen that these policies are embodied in the various activities that will be summarized and introduced later.

5 Beijing News, [23-004] <Open Innovation> Considerations of Chinese Science and Technology Workers Towards Open Innovation, JST Beijing Office, January 17, 2023. Refer to: https://spc.jst.go.jp/experiences/beijing/bj23_004.html

(A) NSFC and its activity policy

Its duties include formulating and implementing funding plans for basic research and for the development of science and technology human resources; receiving and reviewing project applications; managing grant projects; promoting appropriate allocation of scientific research resources; creating an environment for innovation; formulating policy directions and plans for basic research for national development; consulting on national science and technology development issues; and international cooperation with foreign science and technology management departments, funding agencies, and academic organizations.[6]

In its 13th Five-Year Development Plan (2016),[7] the NSFC outlines specific policies for international cooperation: developing research activities using international large-scale scientific equipment; participating in major international science programs; initiating significant international cooperative research projects by Chinese scientists; strengthening cooperation with important international scientific institutions; participating in agenda design and decision-making at international scientific organizations; leadership roles in important international academic institutions; establishing offices in scientifically advanced countries; and improving the level of fund management based on the experiences of developed countries.

The 14th Five-Year Plan sets out Chapter 9, "Deepening International Collaborative Research and Establishing a Global Scientific Research Fund," which specifically states that China will adhere to expanding openness to the outside world; actively integrate into global innovation networks; aim for the world's scientific frontiers and global common issues; strengthen support for outstanding individuals from overseas to come to China for collaborative research and exchanges; and establish a global scientific research fund. It goes on to specify that China will comprehensively and systemically deepen international (regional) cooperation; conduct strategic dialogue and policy consultations with foreign (overseas) science funding agencies and international organizations; organize a wide range of bilateral and multilateral cooperation and exchange activities; and strengthen science, technology, and innovation cooperation in common fields. China will put into practice the philosophy of building a community with a shared future for humanity; aim to achieve the Sustainable Development Goals (SDGs); and promote the implementation of scientific plans for international cooperation in sustainable development. The plan also notes that China will explore new funding mechanisms and new methods to help Chinese scientists utilize large-scale scientific facilities to conduct international collaborative research and exchanges, as well as encouraging domestic scholars to take the initiative in organizing and actively participating in international scientific programs.[8]

(B) CAS

Founded in November 1949, CAS is China's highest level science and technology academic institution and natural sciences and high-tech comprehensive research center, and is an institution directly under the State Council. It is also one of the world's largest science and technology innovation institutions, with research institutes, universities, think tanks, publishers, and invested companies under its umbrella. The CAS's activities are not limited to pure scientific and technological research, and it is also deeply involved in national policy.[9]

6 Refer to: https://spc.jst.go.jp/policy/science_policy/organization/org_17.html

7 https://www.nsfc.gov.cn/publish/portal0/zfxxgk/04/03/info80184.htm

8 Refer to: https://www.nsfc.gov.cn/publish/portal0/tab1392/info87783.htm

9 Refer to: https://spc.jst.go.jp/policy/science_policy/organization/org_12.html

In its 13th Five-Year Plan (2016),[10] CAS also laid out the following with regards to international cooperative relationships: establishing overseas offices in addition to strengthening exchanges with top overseas institutions; improving international influence by expanding international cooperation networks; accelerating the pace of overseas expansion of science and education via the Belt and Road Initiative; participating in global science and technology governance; leading the start of international science and technology programs; and serving in international scientific organizations to increase appointments and influence.

The Outline of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035[11] calls for stronger international leadership, stating "We will implement a more open, inclusive, mutually beneficial, and shared international strategy for cooperation in science and technology and more actively integrate ourselves into the global innovation network. We will pragmatically promote international cooperation in the fields of global epidemic prevention and control and public health, boost joint research and development with researchers from various countries focusing on climate change, human health, and other issues, take the lead in designing and initiating international big science programs and projects, and give play to the unique role of science funds. We will step up the opening-up of the national science and technology programs, launch a group of major science and technology cooperation projects, explore and establish a global research fund, and implement scientist exchange programs. We will also support the establishment of international scientific and technological organizations in China, and welcome foreign scientists to serve in scientific and technological academic organizations in China."

(C) CAST

CAST is a private organization of scientists and engineers that currently has 167 national academic societies in the natural sciences, technical sciences, and engineering technology or related fields, as well as 32 provincial-level scientific and technical associations, many regional and subordinate organizations, and some 4.3 million members dedicated to promoting the development and diffusion of science and technology.[12]

The main activity guidelines in CAST's 13th Five-Year Plan[13] are: improving the quality of academic conferences through holding global conferences; achieving a world-class development level by implementing plans to strengthen the influence of science and technology magazines and deepening international exchange and cooperation for science and technology magazines; strengthening China's voice in the international field of scientific dissemination; promoting scientists' active participation in international organizations; strengthening efforts to recommend talent to international science and technology organizations; strengthening international discourse activities for the science and technology community; holding high-level international science and technology conferences; participating in, hosting, and initiating international scientific programs; establishing headquarters, branches, and program offices with important international science and technology organizations; establishing a new international science and technology organization centered around China; actively participating in responding to global issues such as global climate change, disaster prevention and mitigation, cybersecurity, and human health; promoting international mutual recognition of engineer education; promoting scientific and industrial exchanges and cooperation with emerging

10 Refer to: http://www.gov.cn/xinwen/2016-09/01/content_5104352.htm

11 Refer to: http://www.gov.cn/xinwen/2021-03/13/content_5592681.htm

12 Refer to: https://spc.jst.go.jp/policy/science_policy/organization/org_16.html

13 Refer to: https://www.sohu.com/a/110257779_470013

economies; promoting practical exchanges and cooperation with developing countries; implementing the Belt and Road Initiative researcher exchange program; building a platform for scientific and humanistic exchanges and cooperation along the Belt and Road Initiative, such as by establishing regional international science and technology organizations; building a platform that contributes to national innovation and the development of foreign human resources; and fully implementing overseas informatization plans.

In the area of international science and technology activities, the "14th Five-Year Plan" and "14th Five-Year Plan for the Development of Academic Innovation (2021-2025)"[14] call for CAST to "open up new prospects for non-governmental scientific and cultural exchanges with foreign countries," "expand the breadth and depth of participation in global science and technology governance," and to "build a high-level journal group with international competitiveness, build an international science and technology exchange and cooperation platform, and encourage scientists to actively participate in the work of international organizations and to lead important international organizations." As for specific goals, by 2025 it is stated that China will have 20 world-class academic societies, will have 10 scientific journals that rank within the top 100, will form a top 10 academic activities brand with international influence, and will launch numerous representative models of integrated science and technology.

3. Scientific and Technological Progress Law

Lastly, this paper will look at the provisions of the Law on S&T Progress (revised on December 24, 2021, and came into force on January 1, 2022).[15] This law, including recent amendments, forms the basis for revitalizing China's international cooperation in science and technology. Specifically, Article 80 emphasizes science and technology exchanges between governments, and Article 81 states that scientific and technological innovation and cooperation among Chinese businesses and social organizations will be expanded. Article 82 emphasizes support for research cooperation with outstanding domestic and foreign science and technology human resources, intellectual property protection, and science and technology ethics, and Article 83 encourages participation in science and technology projects by companies in China with foreign investors and by foreign science and technology experts. Finally, Article 84 emphasizes encouraging the return of Chinese science and technology experts who are overseas (nicknamed as "sea turtles") and providing support to attract foreign science and technology personnels (through visas, permanent residency, and welfare/living benefits). It is thought that such legally established policies will support China's international science and technology activities.

Although different from the basic documents listed above, there are also examples of directions in individual policy areas that state that China will strengthen activities to increase its international presence. These are the "125 National Maritime Enterprise Development Criteria" announced in May 2013.[16] The regulations show the specific details of activities when they state that China will "Improve the ability to participate in and influence international maritime affairs, and have continuous development of scientific research activities in international waters and polar regions. (omitted) China will effectively protect, maintain, and guarantee the state's maritime rights and interests, and will

14 Refer to: https://baijiahao.baidu.com/s?id=1709609706184526833&wfr=spider&for=pc

15 http://www.gov.cn/xinwen/2021-12/25/content_5664471.htm

16 Makoto Kawashima, "21st Century China: XI Jinping's China and East Asia," November 10, 2016, Chuokoron-Shinsha, pp. 327-328.

gradually realize the goals of the Maritime Power Strategy."

The background to the policies and directions mentioned above is that China recognizes that it has not gained the comprehensive power and influence of a country that has become the second largest economic power in the world. This has also been pointed out by scholars in China, such as:

(a) China has few academic achievements (papers, books, etc.) at the international level
(b) There are few academic trends, theories, concepts, and factions originating from China
(c) English journals are superior in terms of academic dissemination.[17]

In order to break out of this current situation and increase its international presence, China appears to be sending a political message in all areas/fields in order to gain a voice commensurate with its economic power, and, in response to this, a variety of movements can be seen in the field of science and technology.

[17] Refer to Jisheng Sun, "The Current State of China's International Academic Voice and How to Raise It" (International Communications, November 2022), pp. 52-53, https://www.doc88.com/p-99559774856545.html

3 Significance of international presence and survey items

(1) Significance of the presence China is pursuing

Why is the right to an academic voice so important? When addressing a group study session of the Political Bureau of the CPC Central Committee in May 2021, General Secretary Xi Jinping emphasized the right to an international voice, noting that "Unless China has an international say, it will not be possible to spread China's values and spiritual culture to the world. Only after the Chinese spirit has spread around the world will China's cultural influence and attraction arise. This is also a way to break the West's cultural hegemony."[18]

Since the 18th National Congress of the Chinese Communist Party (November 2012), General Secretary Xi Jinping has emphasized the safety and security of the form of the national consciousness. However, at the 19th National Congress (October 2017), he stated "From the perspective of national security, the essence of the right to an academic voice is the 'right to govern in a form of consciousness,' and we cannot allow the West, with its universal values of freedom, democracy, and human rights, to negatively influence China's mainstream forms of consciousness, such as the Chinese dream, a global community of shared future, and the Belt and Road. By showing the world a China that is 'truly three-dimensional and comprehensive,' we aim to improve China's international standing and image."[19]

Furthermore, at the 30th Group Study Session of the 19th Central Political Bureau (May 2021), General Secretary Xi Jinping said that, "We must focus on promoting China's ideas, China's wisdom, and China's plans. Day by day, China is moving ever close to the center of the world stage. China is a country with sufficient capabilities and sense of responsibility, and wants to contribute to solving the problems facing humanity. We want to let the world know what China can do and what kind of contributions it can make to the advancement of global human civilization; this is not just for China, but for a shared global community."[20]

The above statement may also imply that China's increased presence in international scientific and technological activities will lead to an increase in China's influence in the international community as a whole, which will in turn contribute to political stability itself.

(2) Survey items

This report keeps in mind the findings of other reports regarding China's growing presence in political, military, and economic matters, and, after summarizing China's policies and directions related to international activities

18 Refer to Li Zhang, "Raising China's International Voice in Global Governance" (June 2021) https://m.gmw.cn/baijia/2021-06/09/34910538.html

19 Refer to Guoliang Xu, "The Significance of Raising China's International Voice" (November 2021) https://m.gmw.cn/baijia/2021-11/26/35339239.html

20 Refer to Guoliang Xu, "The Significance of Raising China's International Voice" (November 2021) https://m.gmw.cn/baijia/2021-11/26/35339239.html

centered around science and technology as mentioned above, focuses on five areas: scientific journals, international conferences, international organizations and competitions, international projects, and institutions of higher education. In doing so, this report attempts to understand as widely as possible the facts that indicate China's presence in these international activities.

This report also shows China's presence in terms of international rankings. Although Japan's situation is also sometimes included, the purpose of this report is not to make comparisons with Japan, and as such Japan is not mentioned for all items. Honorific titles are omitted in the text.

Various reports have shown that China has increased the number of papers it publishes, resulting in higher citation numbers, and that China has also increased its number of patent applications, resulting in more patent rights. It has also been pointed out in many articles and reports that Chinese students and post-doctoral researchers have become an important force supporting research in major countries such as the United States. In a sense, these also indicate China's growing presence in international science and technology activities, but these points will only be briefly introduced here in the next section. In addition to the five fields covered in this report there may also be other areas of activity that clearly demonstrate China's presence, and if it becomes necessary to investigate trends in such areas in the authors would like to take the opportunity to do so in later work.

Furthermore, even if the aforementioned significance is kept in mind, the question of how this significance is achieved will not be specifically addressed in this report as it would be necessary to consider a variety of factors from a multifaceted perspective.

4 China's Science and Technology in terms of Major Indicators

A variety of statistical figures have been published showing China's science and technology development in recent years, and they will be briefly introduced here to aid in understanding how China is increasing the development of its international science and technology activities. The following are excerpted from the "Japanese Science and Technology Indicators 2022" produced by the National Institute of Science and Technology Policy (NISTEP).[21]

(1) Research and development investment amount

According to the Japanese Science and Technology Indicators 2022, the in terms of science and technology research and development investment, "China surpassed Japan in 2009 and has continued to increase its lead since then. In 2020 China had investments of 59.0 trillion JPY, an increase of 7.5% over the previous year, which is the fastest rate of growth amongst major countries." Furthermore, when looking at real growth rate with the year 2000 as 1.0, Japan's growth rate in 2020 was 1.3, while China showed a large growth rate of 14.2.

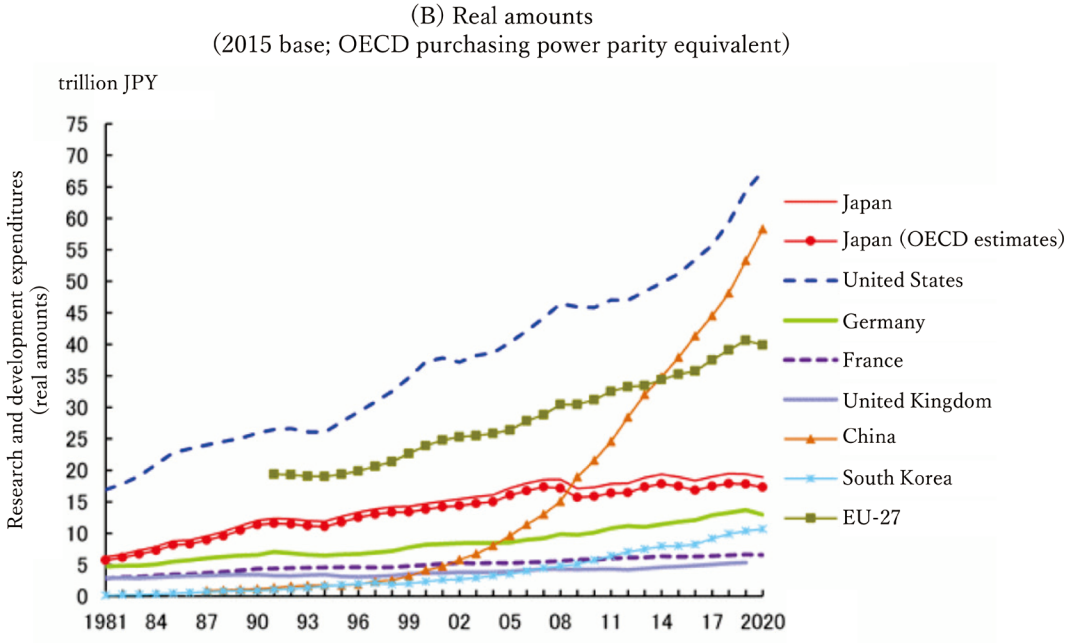


Figure 1: Trends in total research and development expenditures in major countries

Source: Excerpted from "Japanese Science and Technology Indicators 2022"

21 https://www.nistep.go.jp/sti_indicator/2022/RM318_00.html

Looking at governmental budgets shows the size of China's budget and the magnitude of its growth. Although China's budget has recently decreased, it is still the largest in the world, at 24.2 trillion JPY.

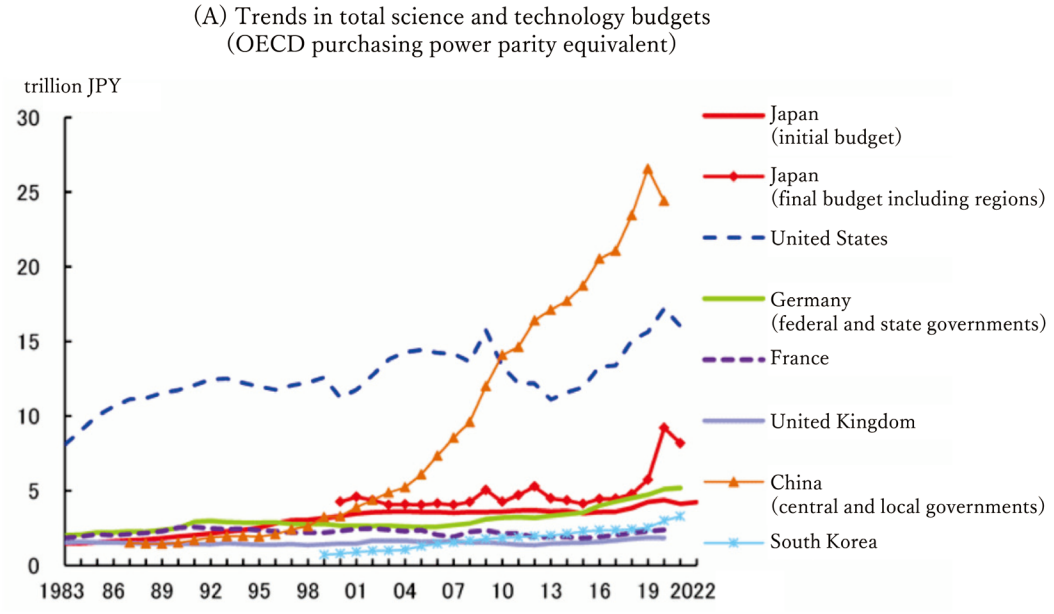


Figure 2: Trends in science and technology budgets for the governments in major countries

Source: Excerpted from "Japanese Science and Technology Indicators 2022"

In China the ratio of government's science and technology budget to GDP remained flat in the 2010s, but recently has slightly decreased to 0.99% (2020).

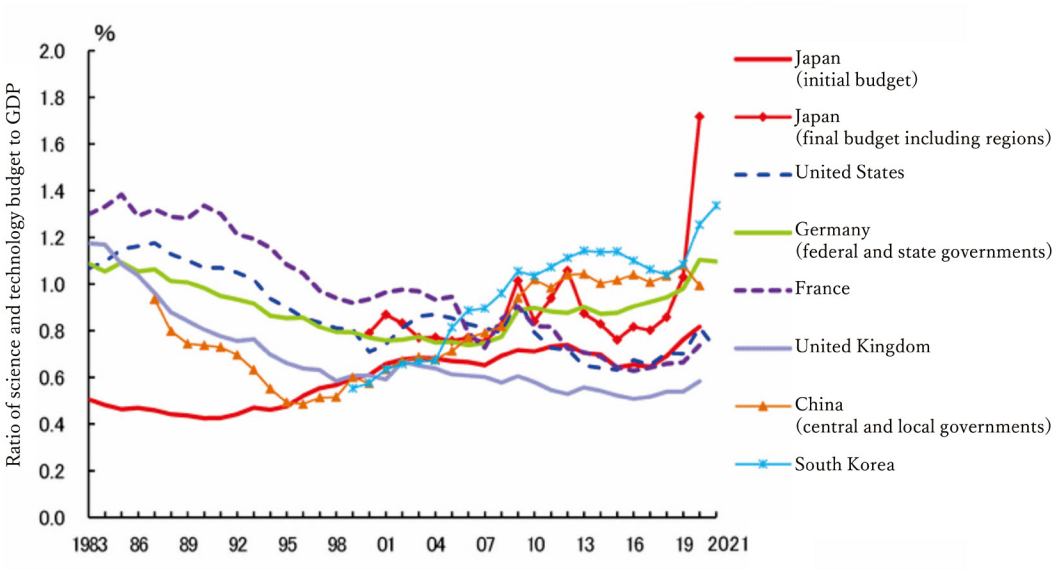


Figure 3: Trends in ratio of science and technology budgets to GDP for the governments in major countries

Source: Excerpted from "Japanese Science and Technology Indicators 2022"

(2) Number of researchers

The number is researchers is usually measured as full-time equivalents (FTE), and the number of researchers in China in 2020 was 2.281 million. This is the highest figure in the world, even exceeding the 1.586 million researchers for the United States (2019).

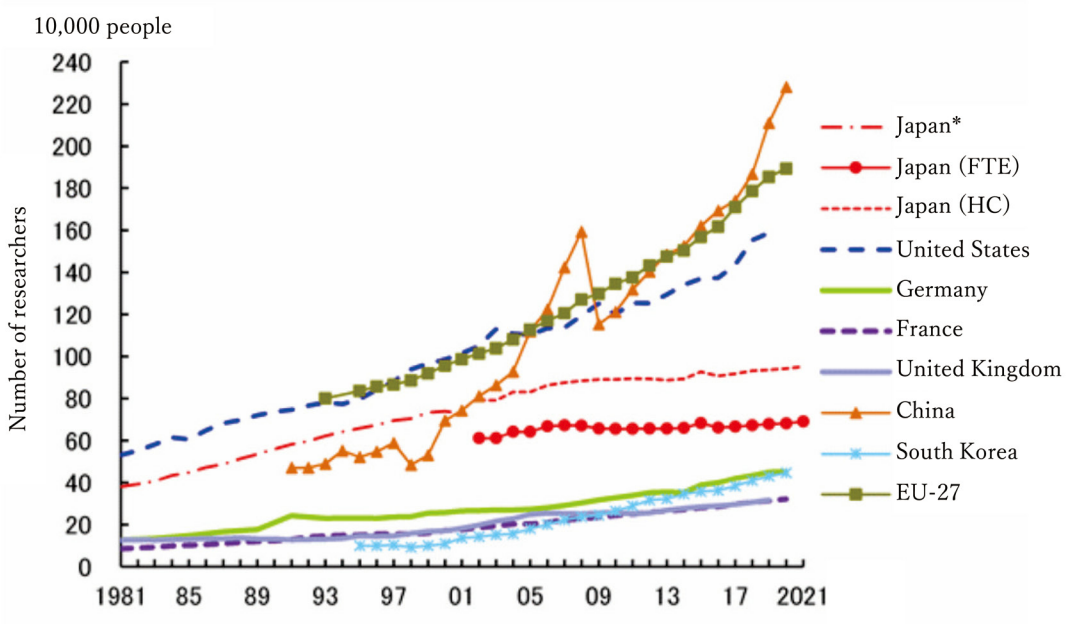


Figure 4: Trends in the number of researchers in major countries

Source: Excerpted from "Japanese Science and Technology Indicators 2022"

However, China's number of researchers per 10,000 people is quite low. In 2020, South Korea had 86.3 researchers per 10,000 people, Germany had 54.3, Japan had 54.1, the United States had 48.3 (2019), the United Kingdom had 47.4 (2019), and France had 47.4, while China had 16.2.

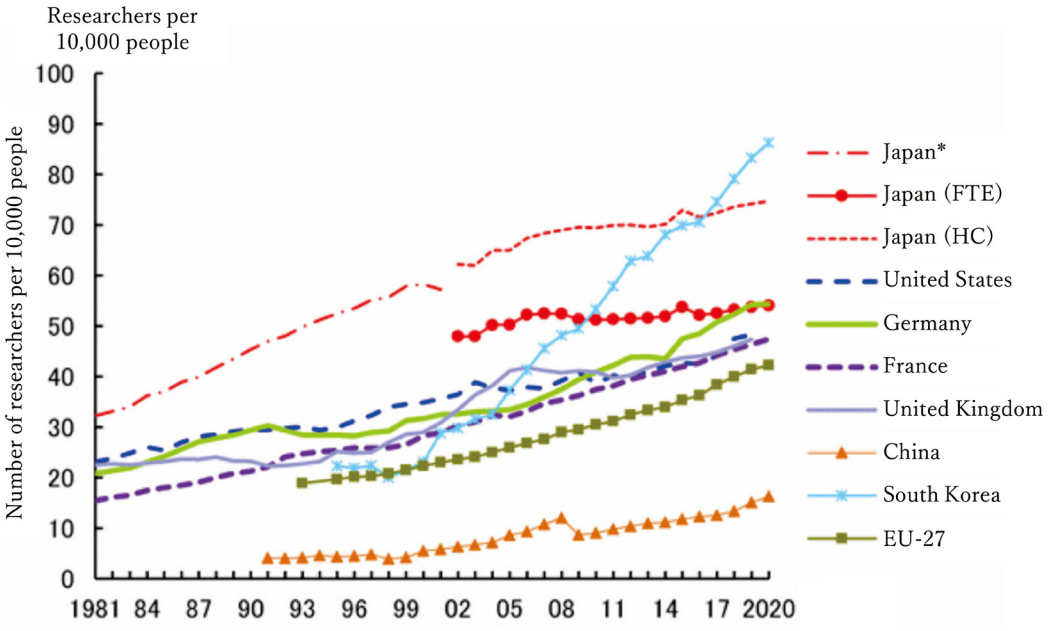


Figure 5: Trends in the number of researchers per 10,000 people in major countries

Source: Excerpted from "Japanese Science and Technology Indicators 2022"

(3) Number of papers and citations

According to Japanese Science and Technology Indicators 2022, "Since the late 1990s, China has seen a remarkable increase in its share of the number of adjusted top 10% scientific papers and in its share of the number of adjusted top 1% scientific papers. As of 2019 (average of 2018-2020 (PY)), China share of the number of adjusted top 10% scientific papers has slightly overtaken that of the United States so that China ranks first in the world (note: figure only shows integer counts for the top 10%)."

Although not shown here, as of 2019 (average of 2018-2020 (PY)) China had overtaken the United States to be ranked first in number of scientific papers, share of the number of adjusted top 10% scientific papers, and share of the number of adjusted top 1% scientific papers. In 2020 China's FWCI reached 1.12, exceeding the world average (0.89 in 2016).[22]

All fields	2018-2020 (PY) (Average)		
	Number of papers		
Country/Region	Fractional counting		
	Papers	Share	World Rank
China	466,410	26.8	1
United States	398,859	22.9	2
United Kingdom	121,494	7.0	3
Germany	114,320	6.6	4
Japan	86,317	5.0	5
India	82,731	4.7	6
Italy	78,532	4.5	7
France	77,529	4.5	8
Canada	72,223	4.1	9
Australia	68,163	3.9	10
South Korea	65,416	3.8	11
Spain	63,935	3.7	12
Brazil	54,693	3.1	13
Iran	43,549	2.5	14
Russia	41,993	2.4	15
Netherlands	41,372	2.4	16
Switzerland	33,849	1.9	17
Poland	32,820	1.9	18
Turkey	32,657	1.9	19
Sweden	29,612	1.7	20
Taiwan	26,226	1.5	21
Belgium	23,361	1.3	22
Denmark	20,796	1.2	23
Saudi Arabia	20,427	1.2	24
Mexico	17,899	1.0	25

[22] Refer to: https://www.elsevier.com/connect/behind-the-rising-influence-of-chinese-research
FWCI is an abbreviation for Field Weighted Citation Impact. FWCI is an abbreviation for Field Weighted Citation Impact. Based on the Scopas data from Elsevier, FWCI is a global average (base value) of the number of citations to a paper for the same publication year, field, and literature type as that paper, with an average value of 1.0.
Reference data: The average value for all papers in the United States is 1.49; the average value for all papers in Japan is 0.95 and the average value for all papers from the University of Tokyo is 1.34. A value of 1.49 means that the papers have a citation rate that is 49% higher than the average.
Refer to: http://www.ach.nitech.ac.jp/~organic/nakamura/FWCI.html

(4) Number of patent applications

The number of patent applications in China rose at an average annual growth rate of 20.7% from 2000 to 2018, but reached a plateau in 2019 and 2020. In 2020 there were 1.5 million patent applications in China, which is 2.5 times the number of patent applications in the United States. The number of patent applications filed by residents rose from approx. 50% in the early 2000s to 89.8% in 2020, indicating a particular increase in patent applications from applicants within China.

All fields	2018-2020 (PY) (Average)		
	Number of adjusted top 10% papers		
Country/Region	Fractional counting		
	Papers	Share	World Rank
China	58,095	33.4	1
United States	55,427	31.8	2
United Kingdom	19,812	11.4	3
Germany	15,694	9.0	4
Italy	11,590	6.7	5
Australia	11,288	6.5	6
Canada	10,263	5.9	7
France	10,084	5.8	8
Spain	8,364	4.8	9
India	7,401	4.2	10
Netherlands	7,318	4.2	11
Japan	7,042	4.0	12
South Korea	6,203	3.6	13
Switzerland	6,117	3.5	14
Iran	5,037	2.9	15
Sweden	4,552	2.6	16
Brazil	4,014	2.3	17
Belgium	3,932	2.3	18
Denmark	3,660	2.1	19
Saudi Arabia	3,354	1.9	20
Singapore	3,185	1.8	21
Poland	2,743	1.6	22
Austria	2,684	1.5	23
Turkey	2,558	1.5	24
Taiwan	2,510	1.4	25

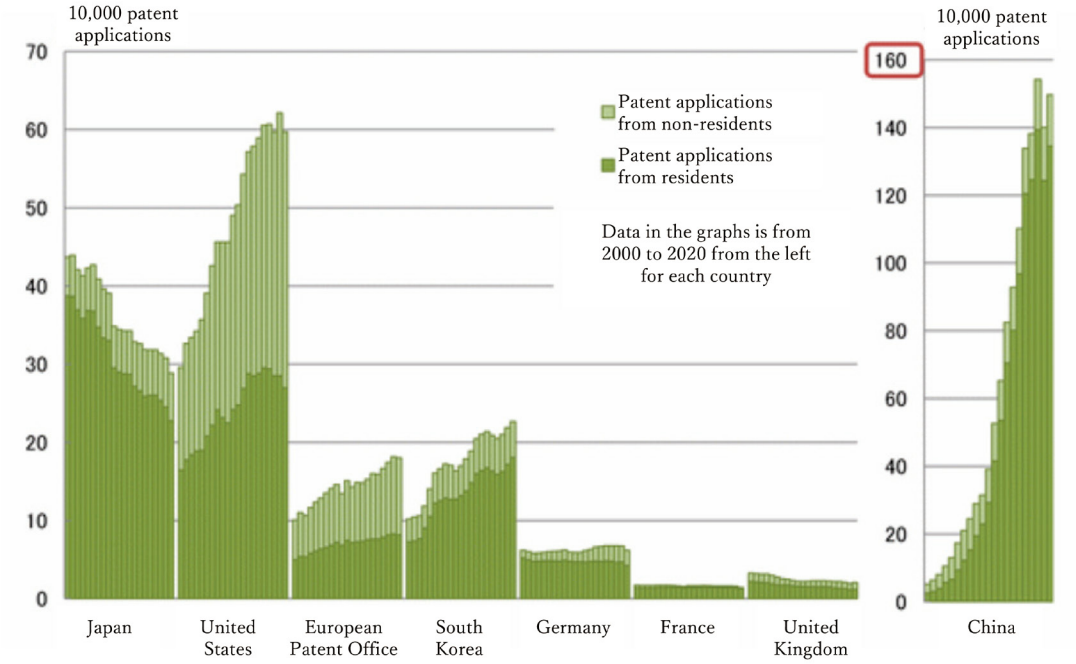


Figure 6: Number of patent applications in major countries

Source: Excerpted from "Japanese Science and Technology Indicators 2022"

5 Scientific Journals

The policy documents underlying China's leadership in science and technology-related international activities are as mentioned above, and in those discussions there was some mention of scientific journals. This section will take a more concrete look at how China is working to increase the international presence of its scientific journals, with a particular emphasis on guidance in specific policy documents.

Although the Chinese government's efforts to promote the strengthening of scientific journals can be traced back to the early 2000s,[23] the focus here will be on policies from the beginning of the Xi Jinping administration.

(1) Guiding opinions on journals

1. "Plan for Promoting the International Influence of Chinese Scientific Journals" (2013)[24]

The goal of this document is to promote the international development of China's scientific journals and to strengthen the international influence and core competitiveness of English-language scientific journals. The plan aimed to establish a high-level English-language scientific journal by the end of the 12th Five-Year Plan, and to reach the top in academic quality and international influence by 2020.

The main content of the plan is to evaluate and recruit scientific journals by dividing their impact factors into four influence grades (A, B, C, and D) and to then set targets and provide funding according to the grades (Example: An "A" grade refers to journals that receive a Q1 or Q2 rating in journal impact factor and that are ranked in the upper range by EI[25] and Medline, etc. Six to ten scientific journals would be selected, and each journal would receive approx. two million RMB per year in support). This initiative is led by six organizations, including the Ministry of Education, CAS, and CAST.

The supported scientific journals must strive to realize the following items:

(a) Have top international scientists serve as editor-in-chief and deputy editor-in-chief

(b) Establish a high-level editorial team

(c) Compose high-quality manuscripts (it is desirable to include many high-quality papers with financial support from China)

(d) Increase the journal's rankings in SCI, etc.

(e) Work on reforming the publishing system and entrust the journal's publishing, editing, and sales, etc. to people

23 Wang Shuhua and Paul R. Weldon, "Chinese academic journals: quality, issues and solutions", LEARNED PUBLISHING VOL. 19 NO. 1 JANUARY 2006. The National Natural Science Foundation of China (NNSF), the predecessor to the NSFC, launched the Key Academic Journal Fund Project, which is said to have funded 24 projects in 2001/02 and 30 projects in 2003/04.
Refer to: https://onlinelibrary.wiley.com/doi/pdf/10.1087/095315106776386995

24 Full text: http://kexie.hust.edu.cn/info/1013/1079.htm

25 EI (Engineering Index): Bibliographic database that covers the widest range of engineering fields in the world, containing over 9 million articles and abstracts from over 5,000 engineering journals, conference proceedings, etc. Is currently published by Elsevier.

who have experience working at internationally renowned journals

(f) Dispatch editorial, publishing, and sales members to leading international scientific journals and provide them with opportunities to deepen their knowledge and experience

(g) Focus on activities promoting the journal

(h) Shorten publication cycles by adopting editing and publishing systems that are said to be internationally mainstream

(i) Actively develop academic activities

(j) Funds obtained through the support must not be used for investments, fines, donations, or for any other purposes unrelated to improving the academic level of the journal or to strengthening its international influence

2. "Opinion on Deepening Reforms to Foster World-Class Scientific Journals" (2019)[26]

The goal of this document is to increase the international competitiveness of China's scientific journals and by 2035 to have one of China's scientific journals become the world's number one scientific journal in terms of overall strength. Particular emphasis is placed on improving journal management skills, publishing market management skills, and international competitiveness.

The main content includes the following four points:

(a) Strengthen scientific journals in the science and technology fields where China is strong, and improve the balance of outstanding journals

(b) Build a database of scientific and technical papers and systemically manage it

(c) Promote the digitalization of journals and improve the ability to publish and manage journals

(d) Ways to increase the international competitiveness of journals need to be devised. Improve the overall ability of journals to gather innovative ideas from top-tier talent around the world, expand journals' international cooperation channels, strengthen support for top-tier international conferences, and develop the same level of quality and effectiveness as overseas scientific journals.

3. "Opinion on Further Promoting the Development of Scientific Journals" (2021)[27]

The goal of this document is to increase the influence of scientific journals' brands, which has the role of building China's spirit, values, and strength, and to form a world-class and famous journal group that represents China's academic level.

The document also states that scientific journals should serve the main battlegrounds of economic and social development, focusing on China's primary needs, build innovative national and scientific and technological capabilities. The following points are emphasized:

[26] Full text: http://qks.hzau.edu.cn/info/1014/1202.htm

[27] Full text: https://kyc.whit.edu.cn/info/1086/3799.htm

(a) Strengthen the establishment of editorial boards, improve peer review mechanisms, and rigorously implement content management systems

(b) Request that authors provide high-level professional review opinions, and build a big database of scientific papers and a world citation database

(c) Deepen exchanges and cooperation with international peers; participate in global academic governance; support the selection of overseas co-editors; increase the proportion of international members on editorial boards; and demonstrate supporting roles for overseas editors in drafting, peer review, and editing

(d) Add English-language abstracts to Chinese-language articles, promote the addition of Chinese-language abstracts to English-language articles, and increase the number of overseas users

(e) Establish overseas branch offices for periodicals and localize operations

(f) Implement measures against fraud, warn against overemphasis on IF/SCI, and utilize results publishing in Chinese journals in research funding applications (clarify percentages), etc.

Additionally, at the 3rd Group Study Session of the Central Political Bureau held in July 2023, General Secretary Xi Jinping gave instructions to "accelerate the development of world-class science and technology journals" as part of measures to strengthen China's basic research.

4. Chinese Science and Technology Journal Excellence Action Plan (2019 to 2023)[28]

The plan is a five-year cycle and is being jointly implemented by the Ministry of Finance; Ministry of Education; Ministry of Science and Technology; State Administration of Press, Publication, Radio, Film and Television; CAS; CAST; and the Chinese Academy of Engineering. Its goal is to improve the quality of scientific journals and to contribute to the realization of the goal China becoming a scientific and technological powerhouse.

The main content of the plan aims to optimize professional management ability and the structural layout of scientific journals and publications, to improve the management abilities and international competitiveness of the publishing market, and then divides financial support into five projects: (1) Leading journals (journals aiming to build top international journals) (22 publications), (2) Priority journals (journals that focus on priority constructions fields, that have a well-established foundation, and that have great potential for development) (29 publications), (3) "Echelon" journals (journals with three specialized directions: basic research, engineering technology, and the popularization of science; "echelon" here refers to a formation) (199 publications), (4) New journals with a high starting point (high-level English-language science and technology journals, and journals that are at a high level from the beginning due to cooperation with foreign countries (30 publications), and (5) "Clustering / pilot" journals (journals with different features, levels of clarity, and complementary resources, and that leverage academic resources from prestigious scientific research institutions and academic societies) (5 publications).

The number of China's "English-language journals" listed in the Excellence Action Plan (below, the numbers in parenthesis indicate the percentage of total journals) is 17 publications for leading journals (77%), 19 publications for priority journals (66%), 87 publications for echelon journals (44%), and 7 publications for new journals with a high

[28] Full text: https://www.scuec.edu.cn/xuebao/info/1011/1030.htm

starting point (23%).[29]

Incidentally, CAS-led scientific journals are introduced on the CAS website,[30] and more information about the various journals can be found by navigating through them. For example, there are 355 registered CAS-led journals, which includes non-academic journals, 328 academic journals, 113 English-language only journals, and 17 journals that are published in both Chinese and English. Of the 113 English journals, 74 are registered as SCI papers. This is a significant number for scientific journals led by an academic institution.

(2) International collaboration in scientific journals

As will be shown later, in addition to fostering Chinese journals, China is also collaborating with major scientific journal publishers around the world to publish its journals. It is thought that China's aim is to utilize the know-how and name recognition of major scientific journal publishers to create journals with high impact factors. For example, the "National" in *National Science Review* published by Oxford University Press refers not to the United Kingdom, but to China. The journal's editorial board includes the (former) director of CAS and international members, including many Chinese nationals, and is believed to be effective in forming networks with outstanding researchers from around the world.

A report by NHK (Japan's national public broadcaster) on *Nature's* cooperation with Chinese journals, entitled "In Response to China's New Strategy to 'Take the Initiative with Scientific Journals,' Japan is..." touched on China's efforts to "create a Chinese version of *Nature*," and introduced a situation wherein China is attempting to take the lead in science by creating a famous science journal.[31]

In November, China Science Publishing & Media Ltd. signed an agreement with the Société Française de Physique, Société Chimique de France, Société Française d'Optique, and Société de Mathématiques Appliquées et Industrielles (the French scientific societies for physics, chemistry, optics, and applied mathematics and engineering) to purchase 100% of EDP Science's shares. At the time, EDP Science published 58 English journals and 17 French journals.

Major international journals and databases have begun to set up offices in China, and in these instances Chinese nationals are often appointed as executives. It is thought that these major companies are treating China not just as dispatch locations or liaison offices but as the base for a large market,[32] and that they are working to increase the impressions of international conferences, etc. through China's participation.

In any case, increasing the number of English-language scientific journals originating from China provides access to the latest research trends prior to publication through peer review of papers that are scheduled for publication in scientific journals, and additionally also has the effect of becoming a hub for international researcher networks.

29 The "Chinese Scientific Journal Development Report 2021" states that, as of the end of 2020, there are 375 English-language science and technology publications. https://m.gmw.cn/baijia/2022-08/25/35978421.html

30 Refer to: http://journals.cas.cn/pnav/

31 https://www3.nhk.or.jp/news/special/sci_cul/2019/10/story/story_191007/

32 Information on the size of the Chinese market for scientific journals is difficult to find. Although the data is somewhat old, in 2016 the market was CNY24 billion. (Lisa Campbell, "Growing Chinese journals market 'too big to ignore', PA report says", THE BOOKSELLER, Aug. 24, 2016. Refer to: https://www.thebookseller.com/news/growing-chinese-journals-market-too-big-ignore-pa-report-says-381306)

(3) Attempt at evaluating scientific journals originating from China

As indicated in some of the guidance opinions mentioned above, it is extremely interesting to see what indicators are being used by publishers receiving such financial support to demonstrate that their goals have been achieved. Looking at "Opinion on Further Promoting the Development of Scientific Journals" (2021), there are items that can easily be used as indicators, such as "increase the proportion of international members on editorial boards" and "increase the number of overseas users," but no specific numerical targets are listed, which makes objective evaluation difficult.

Because the goal is to internationalize Chinese scientific journals, the following evaluation perspectives can be considered:

(a) Number of English-language journals in China
(b) Number of journals originals from China in SCI
(c) Position of Chinese-led English-language journals in international journal rankings
(d) Number (ratio) of Chinese editors in China for scientific journals that are placed highly in international journal rankings
(e) Number (ratio) of papers submitted by non-Chinese nationals to English-language journals in China

The authors have not yet come across a comprehensive and objective evaluation (result) from these perspectives, but this is probably because it is difficult to obtain unified information from China that is consistent as a whole.

1. Evaluations by China itself

(a)Evaluation by the Institute of Scientific and Technical Information of China (ISTIC)

For reference, an analysis and evaluation of Chinese scientific journals, published by the Institute of Scientific and Technical Information of China (ISTIC), will be cited.[33]

In 2021, 21 Chinese scientific journals reached the top 25% of their academic fields in total citations, an increase of 3 journals compared to 2020. It was reported that 108 journals were in the top 25% of each field in terms of impact factor, an increase of 23 journals, that the international influence of Chinese scientific journals was increasing, and that an increasing number of journals are being included in international search databases and being highly ranked in each field. The average impact factor of international scientific journals in China was 6.115, an increase of 42.4% from the previous year, and 38 journals had an impact factor of 10 or higher, an increase of 17 from the previous year. The average number of citations per year for Chinese international science journals is 4.063 citations, an increase of 22.4%, and the number of journals with more than 10,000 total annual citations is said to be 19, an increase of 12 journals. Five journals have more than 20,000 citations, indicating that the influence of Chinese scientific journals is

[33] [23-010] <Paper Statistics> Summary of Chinese Science and Technology Paper Statistics 2022 Announcement, Beijing News, JST Beijing Office, February 6, 2023. Refer to: https://spc.jst.go.jp/experiences/beijing/bj23_010.html
Note that CAS independently requests "journal rankings," but the details are not available. From the following analysis it can be seen that the evaluations are quite analytical. Refer to: https://arxiv.org/ftp/arxiv/papers/2006/2006.05047.pdf
However, this is also referred to as a classification table, and, in order to improve the situation wherein the so-called impact factor has been used as a means to compare journals in different fields, it can be understood that the Documentation and Information Center of the Chinese Academy of Sciences has provided it as reference information (reviewed yearly), classifying journals into 13 major fields and 178 subfields and ranking them into four categories one to four. Refer to: https://www.las.ac.cn/front/knowledgeServices/serviceDetail?entityId=26&entityType=ApplicationMart

continuously increasing, that they are meeting important national needs, and that they are continuing to strengthen their ability to attract high quality papers. However, it is unclear whether such evaluation methods allow for comparisons with Western scientific journals in general.

(b)Evaluation by WeChat

Cactus Communications[34] and the Chinese-language version of Scientific American have jointly published a ranking that shows the influence of academic journals,[35] and this will be used as a guide. This was determined by analyzing approx. 70,000 articles posted on WeChat in the first quarter of 2021 and derived by individually extracting the number of article views for more than 1,200 Chinese and foreign journals from the titles; the outstanding academic journals were then listed.

According to this ranking, *Nature, Cell,* and *Science* are naturally ranked high, but, of the top 500 journals, 137 are Chinese academic journals, accounting for 27% of the total. The top three journals were *Molecular Plant* (17th), *The Innovation* (22nd), and *Horticulture Research* (25th), with 22 journals in the top 100. It should also be noted that it was not easy to find these top three journals in the aforementioned SCImago Journal & Country Rank.

These 500 journals are published by 68 publishers, and it goes without saying that Western publishers account for the majority, with Elsevier accounting for 75 of the journals. There are 19 Chinese publishers, with KeAi Publishing, China Science Publishing & Media, Power System Technology, Science in China Press, and Light Publishing Group being mentioned.

Although these results are based on statistical figures based on WeChat users, they are interesting in terms of evaluating Chinese scientific journals.

2. Position in international journal rankings

This section will now present an evaluation using statistics related to SCI papers, which it is believed China does not necessarily seek to rely on. For this purpose, the authors looked at Chinese-led English-language scientific journals by their positions in 2022 international journal rankings.

The journal database used as a reference is the SCImago Journal & Country Rank[36] (publicly available portal that includes the journals and country scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.)). This database uses the SCIMago Journal Rank Indicator (SJR), which is the average weighted citation count of papers published in journals over the past three years.[37] The authors believe that this database will lead to an evaluation of international journal rankings that corresponds with the perspective presented

34 Cactus Communications is a technology company that accelerates scientific progress, providing academic, research dissemination, medical communications, and technology solutions to the scientific community. Founders Anurag and Abhishek Goel founded the company in Mumbai, India in 2002 with the dream of helping researchers around the world publish their papers.

35 Refer to: https://cactusglobal.com/jp/press/the-global-ranking-of-academic-journals-impact-on-wechat-announced/

36 https://www.scimagojr.com/journalrank.php

37 SJR: This metric takes into account not only the prestige of the citing scientific journals, but also their proximity to the citing journals using the cosine of the angle between the vectors of the two journals' co-citation profiles. Nature Review Molecular Cell Biology is 34.201, Cell is 26.494.

above in item (c).

In this ranking, amongst all journals the top 10 positions are occupied by American and British journals, led by *Ca-A Cancer Journal for Clinicians*. The following Chinese journals, which are in the top five in China in the country's national rankings, are ranked as follows amongst all journals.

Table 1: International ranking of top scientific journals in China based on SCImago Journal & Country Rank

Ranking in China	Scientific journal name	SJR	Ranking among all journals
1	*AI Open*	4.726	300
2	*Mycosphere*	3.918	390
3	*Protein and Cell*	3.367	503
4	*Engineered Regeneration*	3.25	535
5	*Communications in Transportation Research*	3.188	558

Source: Created by the authors from text citation database

In addition to *Mycosphere* in the above table, *AI Open, Engineered Regeneration*, and *Communications in Transportation Research* are listed as Elsevier journals, and Protein and Cell is listed as a Springer journal. Incidentally, the SJR of the aforementioned *Ca-A Cancer Journal for Clinicians* from the United States if 56.204.

3. Chinese editors of scientific journals

The number (ratio) of Chinese editors in China for scientific journals corresponds to item (d) above, and is one way to evaluate how internationalized Chinese scientific journals are. Looking at it the other way around, this metric also leads to an evaluation of the extent to which non-Chinese editors are involved (however, it is quite difficult to identify and evaluate the non-Chinese editors, so this point will not be discussed in particular).

The following figures are for the journals listed above in Table 1 for which information on the editors could be obtained. The editors includes chief editors and associates, but does not include board members. Additionally, editors with Chinese names who are believed to be residing in mainland China (including Hong Kong) are determined by their affiliated instiutions, and editors with Chinese names who are located outside of mainland China (including Hong Kong) are not included.

For *AI Open*, which is ranked first amongst journals in China, out of a total of seven editors, four (57.1%) are Chinese.[38] *Mycosphere*, ranked second, has 13 Chinese editors out of 58 editors (22.4%)[39]; *Protein and Cell*, ranked third, has six Chinese editors out of seven editors (85.7%); *Engineered Regeneration* has four Chinese editors out of

38 Refer to: https://www.sciencedirect.com/journal/ai-open/about/editorial-board

39 Refer to: https://mycosphere.org/editors.php

eleven editors (36.4%);[40] and *Communications in Transportation Research* has three Chinese editors out of four editors (75%).[41]

There may be various opinions on how to evaluate these figures (ratios), but it is said that in judging the quality of a journal, diversity of members, such as editors, is required to make it "international."[42]

4. China's presence in major scientific journals[43]

Next, this report will look at China's presence in major scientific journals.

When an individual is appointed to the editorial board of a scientific journal, it means that they are recognized by the scientific community as a top-class researcher in their field.

First, looking at *Science*, since 2019 the editor-in-chief has been Holden Thorp, a former provost at the University of Washington, and the editorial board in 2022 included a total of 221 people, including one from Japan, six from China, one from India, and two from South Korea. *Science* had one Chinese editorial board member in 2010, two in 2012, three in 2021, and six in 2022.

Angewandte Chemie, a top journal for chemistry, has had Neville Compton as its editor-in-chief since 2018, and for its 2022 structure it had a scientific advisory board and an international editorial board. China has steadily increased its number of board members since the 2010s, and has surpassed Japan since 2020.

At Cell,[44] which is considered to be the most inernationally acclaimed biological sciences journal, the number of Chinese editors residing in China is 13 out of 127 (approx. 10%) (incidentally, there are two Japanese editors residing in Japan).

Of the 92 editors at *Nature*, only one is Chinese.[45]

For the *New England Journal of Medicine* (NEJM), which has a solid reputation as an international medical journal, at least one Chinese editor was confirmed out of 37 (zero Japanese editors).[46]

Finally, looking at the Journal of the American Chemical Society (JACS),[47] Erick Carreira of the Swiss Federal Institute of Technology was appointed as the new editor-in-chief in 2021, and, regarding China, out of the 31 executive editors three are Chinese, while out of the 32 editorial committee members, four are Chinese, including CAS President Bai Chunli (incidentally, three members of the editorial committee are Japanese).

40 Refer to: https://www.sciencedirect.com/journal/engineered-regeneration/about/editorial-board

41 Refer to: https://www.sciencedirect.com/journal/communications-in-transportation-research/about/editorial-board

42 "Little geographical diversity of board members and claim to be international.", Cabell's Predatory Reports,

43 "Japan, China, India, and Korea in the Scientific Community," JST Evidence Room materials https://jst20.sharepoint.com/sites/keieikikaku/DocLib/%E3%82%A8%E3%83%93%E3%83%87%E3%83%B3%E3%82%B9%E5%88%86%E6%9E%90%E5%AE%A4/%E3%83%97%E3%83%A9%E3%82%B9%E3%82%A8%E3%83%93%E3%83%87%E3%83%B3%E3%82%B97/plasevidence-7_20230320_low_Ch2.pdf

44 Refer to: https://www.cell.com/cell/editors-and-staff

45 Refer to: https://www.nature.com/nature/editors

46 Refer to: https://www.nejm.org/about-nejm/editors-and-publishers?query=footer

47 Refer to: https://pubs.acs.org/page/jacsat/editors.html

5. The future of Chinese scientific journals

In the world of international journals built by the three major academic publishing companies[48] that lead the major scientific journals in the west, China is aiming to increase the international appeal and international competitiveness of its own scientific journals to claim the number one position for scientific journals in terms of overall strength by 2035. Although it will be necessary to monitor future developments, it is thought that the following perspectives will be important.

First, the unique editing and publication methods of Chinese scientific journals may also have an impact. It is said that in China's excellent scientific journals, the editors select cutting-edge researchers and ask them to write articles for publication.[49] This is different from the process of Western scientific journals, wherein the researchers themselves decide which journals to publish in and are then selected and screened. There is no research on how widespread this practice is, and this is an important factor to consider when looking at the future of Chinese scientific journals.

Another perspective is that this has the effect of increasing the opportunities for Chinese reviewers to pre-screen papers, which thereby promotes the flow of the latest information to Chinese researchers. Of course, this is not limited to China. On the other hand, this is an issue that touches on researcher ethics related to the peer review system. The tension between authors and reviewers has been discussed in relation to the peer review system, and there is a movement to ensure the openness of the review process through some system.[50] That is to say, there is a movement to record and clarify who reviewed which papers and what kind of discussions took place. It remains to be seen how China will respond to these new developments in the Western scientific journal system itself, with which China is not necessarily in sync.

As shown so far, China has been increasingly active in improving the international status of the scientific journals it leads, but it can also be said that it will take a considerable amount of time for them to attract researchers from around the world and become leading journals in the international arena. However, there is still more than a decade until the 2035 target. There will be serious research from a variety of perspectives, including, but not limited to, seeing what can happen until then, and how the international expansion of Chinese scientific journals will affect the development of China's own scientific and technological capabilities and research capacity.

(4) Open access to articles and data regulations

Open access to papers has been discussed internationally for some time. A detailed history of these discussions and an introduction of their content will be left for other work, but the scientific community views the gradual transition to open access as a development, although there are some twists and turns regarding the exact methods. In other words, the idea is that it is important that papers that are scientific, technological and academic achievements be made

48 Elsevier, Springer Nature and Willie Blackwell.

49 "When an excellent research project that seems like it is starting to emerge or bud is found, the individual in charge is immediately contacted and they are directly asked to write a paper," quote from "Aiming to be World-Class: Shining a Light on the Development of Chinese Science and Technology Journals (Part 1)" (June 23, 2021, quoted from Xiuying Cao (reporter for the Science and Technology Daily)) https://spc.jst.go.jp/hottopics/2107/r2107_cao.html

50 "Nature is trialling transparent peer review — the early results are encouraging," Nature, EDITORIAL, 01 March 2022, https://www.nature.com/articles/d41586-022-00493-w

widely available as soon as possible, shared by many researchers, and then linked to further intellectual development. This is reflected in the fact that the United States Office of Science and Technology Policy (OSTP) has announced an update to its, which includes eliminating the 12-month embargo period for papers that are the result of publicly funded research.[51] A variety of issues have of course been pointed out, including the financial burden, maintaining the quality of papers, protection of personal information, and relationships with other legal regulations, but the wisdom of overcoming these issues will eventually emerge.[52]

Having provided this introduction, it should be noted that this issue has developed in a complex manner from three aspects: open access to papers, open access to research data, and then open science, which integrates the other two aspects. Discussions on the openness of research data have recently developed in an institutional direction, building on open access to papers, but are much more complex than the debate on open access to papers.[53] Finally, open science has a broader and deeper dimension as it is also an argument for managing and utilizing research methods, research results, and research data as integrated intellectual assets. As such, the discussion here will be limited to open access to papers. However, as will be explained later, papers themselves are not completely unrelated to the issue of open data, and there will always be discussions about the publication of data.

China's stance on the issue of open access is said to have been made clear in December 2003, when then-CAS President Lu Yongxiang signed the Berlin Declaration on Open Access.[54] [55] Since then, China has not formulated a national-level policy, but representative institutions are said to be actively leading open access activities. The first major response to what can be considered an international trend came in 2014. In May of that year, CAS and NSFC announced that they would jointly promote open access to articles. The CAS announcement stated that, "Papers that are the result of public funding are resources shared by society as a whole, and it is scientists' duty and responsibility to make the papers available to society," and required that researchers and graduate students submit the final, peer-reviewed version of their paper to their institution's open access repository (within 12 months of publication).[56] Up

51 "Update their public access policies as soon as possible, and no later than December 31st, 2025, to make publications and their supporting data resulting from federally funded research publicly accessible without an embargo on their free and public release", August 25, 2022, MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES, https://www.whitehouse.gov/wp-content/uploads/2022/08/08-2022-OSTP-Public-Access-Memo.pdf

52 For general background information, refer to "Background, Current Status, and Challenges Regarding Open Access," compiled by the Cabinet Office Science, Technology and Innovation Promotion Office in November 2022. https://www8.cao.go.jp/cstp/gaiyo/yusikisha/20221110/siryo2-1.pdf

53 For more information on open data, refer to "Trends in the Sharing of Research Data (Open Data)" compiled by JST/CRDS (February 2023): https://www.jst.go.jp/crds/pdf/2022/FU/TP20230203.pdf

54 On October 22, 2003, the Max Planck Society adopted the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities. Major research institutions from Germany, France, Italy, Norway, and other countries, as well as the German Library Association, attended the international conference that was sponsored by the Max Planck Society. The Declaration calls for (1) "encouraging our researchers/grant recipients to publish their work according to the principles of the open access paradigm," (2) "encouraging the holders of cultural heritage to support open access by providing their resources on the Internet," and (3) "developing means and ways to evaluate open access contributions and online journals in order to maintain the standards of quality assurance and good scientific practice." (quoted from https://openaccess.mpg.de/67605/berlin_declaration_engl.pdf)

55 Ying Li (Institute of Scientific and Technical Information of China) and Ruiqiang Tian (Institute of Scientific and Technical Information of China), "China's Efforts Regarding Open Access and the Actual State of Science and Technology Journals," Current Awareness (National Diet Library), No. 334, December 20, 2017, https://current.ndl.go.jp/ca1909

56 「"CAS and NSFC Jointly Promote Open Access for Papers" (Chinese Academy of Sciences, Foundation Committee: 公共资助论文可开放获取), JST/CRDS, Daily Watcher, July 2, 2014, https://crds.jst.go.jp/dw/20140702/201407021840/
At the time, instead of immediately publishing after peer review, a hybrid model was proposed in which papers would be published after a certain period of time.

until now, the Science and Technology Important Research Project Management Ordinance had stipulated that "results should be made public with a clear indication that they were created with funds from XXXX." Incidentally, China is said to have agreed to the so-called Plan S,[57] and, according to an Elsevier article from July 2022, about one-third of papers by Chinese authors are published under Gold Open Access.[58]

Recent policy documents include "Opinion on the Establishment of a State Council Data Foundation System to Better Perform the Role of Data Elements (December 2022),"[59] which is also known as "Data Article 20". This document states that research results should, in principle, be made open and shared; that public data (including research results funded by public funds), corporate data, and personal data should be managed separately; and prohibits monopolization by specific institutions.

On the other hand, this "Data Article 20" also states as a general requirement to "comply with a systematic plan to maintain national data security" and to "ensure the security of national data." At the same time, the policy states that the government will be deeply involved in the formulation of international high-level digital rules.

Based on the above, it is natural for China to support open access, particularly given the view that articles being made open access will have higher visibility and more citations. China's basic stance is not to give in to the current state of scientific journals, which are led by large Western publishers and are mainly evaluated by impact factor, and the sharing of articles through open access is in line with this Chinese stance.

However, it will be interesting to see how China will proceed with data disclosure through such open access. For example, in March 2022, a *Nature* article[60] stated that the Chinese government's Ministry of Science and Technology is considering draft guidelines for regulating the use of genetic information. Some researchers are said to be concerned that if such regulations are implemented, they may have a negative impact on international cooperation. Furthermore, a "National Data Administration" was created in March 2023 organizational reforms, but data safety regulations will continue to be under the jurisdiction of the Central Cyberspace Affairs Commission.[61] The way in which data is released as research results is an issue that requires attention in light of the Chinese government's overall stance on open access, open data, and open science.

57 Plan S has 10 principles, which can be summarized into three points: (1) Academic publications must be immediately made available as open access after publication (no imposition of paywalls or embargoes), (2) The Creative Commons CC-BY license is recommended, and the copyright is held by the author or the organization/institute with which they are affiliated, and (3) Subscription journals and hybrid journals must commit to converting to full open access. (from "Plan S: An update on what's happening and what's in store" https://www.editage.com/insights/plan-s-an-update-on-whats-happening-and-whats-in-store)

58 "Behind the rising influence of Chinese research", By Pan Zhang and Zhuoling Liao - June 27, 2022, Elsevier Connect. Refer to: https://www.elsevier.com/connect/behind-the-rising-influence-of-chinese-research
In 2023, China's collection of gold open access papers is estimated to be more than half that of the United States. It is also said that there is a subsidy of about $3,000 per paper.

59 CPC Central Committee, "国务院关于构建数据基础制度更好发挥数据要素作用的意见"
http://www.gov.cn/zhengce/2022-12/19/content_5732695.htm

60 Smriti Mallapaty, "China expands control over genetic data used in scientific research", Nature, 06 May 2022, https://www.nature.com/articles/d41586-022-01230-z

61 Reading the National People's Congress: The Aim of China's Establishment of the "National Data Administration", March 17, 2023, https://www.nri.com/jp/knowledge/blog/lst/2023/souhatsu/china_trends/0317

6 International Conferences and Conventions

(1) Large-scale international conferences and conventions

It is clear from the documents issued by the CPC Central Committee and the State Council that China has taken the initiative in holding international conferences and conventions, and in disseminating their achievements. This section will look at how primarily China-hosted international conferences and conventions (hereinafter simply referred to as "international conferences") have developed.

First, there are various types of international conferences, and, as a prerequisite to being evaluated for demonstrating the international initiative emphasized in policy documents, it is necessary to provide guidelines as to what type of "international" should be considered in line with the policy documents. In China, the names of companies and international conferences have long been regulated according to a uniform policy. Putting aside the issue of corporate names, the authors will introduce the rules for naming international conferences, and these rules will be used as a premise for understanding the information in this section.

Regarding the naming rules for international conferences held in China, there is reportedly a CPC Central Committee and State Council regulation entitled "Management Methods for Holding International Conferences in China (关于在华举办国际会议的管理办法)" (中办发〔2006〕10号), but this information is not currently available to the public.[62]

Based on the detailed implementation rules established by each research institution in response to the regulation, the rules that can be inferred as generally as follows:

(a) In principle, use of a name such as "summit," "international forum," "world conference," "global conference," or "high-level conference," requires approval from the State Council or the departmental/ministerial level depending on the nature, level, and theme, etc. of the conference. Furthermore, some conference names, such as "China International XXXX Conference," must be accompanied by an actual situation and must be an international scientific activity in accordance with the principles of the International Science Council (ISC).[63]

(b) For universities, application and approval must be made to the relevant government department through the department in charge of international exchange, etc.

(c) In particular, conferences that require approval from the State Council are: Conferences sponsored by the United Nations and various professional/specialized organizations, conferences sponsored by important governmental and non-governmental international organizations, conferences related to China's core interests, international conferences that will be attended by ministerial and higher officials or former heads of state and government

62 「关于在华举办国际会议的管理办法）」(中办发〔2006〕10号）, Beijing News [21-062] Regarding Chinese Company Names and International Conference Names, JST Beijing Office, December 28, 2021, https://spc.jst.go.jp/experiences/beijing/bj21_062.html

63 There are eight International Science Council (ISC) principles, including openness of scientific results, peer review, and respect for publishing traditions. Refer to:https://council.science/actionplan/why-scientific-publishing-matters/publishingprinciples/

from other countries, and international professional/academic conferences in natural science or technology fields with more than 300 foreign participants or 800 or more total participants.

(d) International conferences other than those listed above must, in principle, be approved at the departmental/ministerial level.

As such, the various world conventions and international conferences described below are considered to be organized and held in accordance with the above rules. Here, some events held in 2021 and 2022 that could be learned about through various news sources are introduced.

[2021]

(a) 2022 World 5G Convention (three days from August 10, 2021 in Harbin City, Heilongjiang Province): Held simultaneously online and offline, and co-sponsored by the National Development and Reform Commission, Ministry of Science and Technology, Ministry of Industry and Information Technology, and the People's Government of Heilongjiang Province.[64] The World 5G Conference was the world's first international event in the 5G field, and has already been held three times. The conference includes conference forums, exhibitions, selected outstanding applications, and application contests, etc. It fully demonstrates the technological progress of the 5G industry, upstream and downstream collaborative innovation, and examples of applications.

(b) 2021 World Intelligent Manufacturing Conference (three days from December 8, 2021, Nanjing International Expo Center, Nanjing City, Jiangsu Province): Co-sponsored by the Ministry of Industry and Information Technology and the Jingsu Provincial People's Government. The theme of the conference was "making manufacturing smarter," the conference focused on trends in the development of smart manufacturing, research discussions were held on various practical application areas in the manufacturing industry, and relevant policy makers in the smart manufacturing field from many countries such as the United States, Germany, and Switzerland, industry organizations, scientific and technological research institutes, and more than 500 companies from around the world participated.[65]

In addition to the above, the China International Consumer Products Expo was held for the first time on May 12, 2021.

[2022]

(a) World Robot Conference 2022 (August 18, 2022, Beijing): This was the first time that the conference had been held since 2015, with the conference being managed and continued by CAST, as well as being managed by the Beijing city government and the Chinese Institute of Electronics, etc. For the first few times, the conference was held as a nationally important event, with the President sending a message and the highest leadership officials

64 "World 5G Conference 2022 Opens in Harbin on August 10th," Science Portal China, Science and Technology News, June 29, 2022, https://spc.jst.go.jp/news/220605/topic_3_04.html

65 "World Intelligent Manufacturing Conference to be held in Nanjing, China," Xinhua News Agency, December 8, 2016, http://jp.xinhuanet.com/2016-12/08/c_135890342.htm

attending. The conference was sponsored by the IEEE as well as by robotics-related academic societies in the United States, the United Kingdom, other European countries, Australia, Russia, Israel, South Korea, Singapore, Malaysia, and Japan, as well as by JST. Fairs and competitions are also held at the same time as the conference, with exhibitions by large-scale and global companies, and, before the global spread of COVID-19, it had become a gathering place for leading robotics researchers and related parties from around the world. The theme of the conference was "Innovation, Sharing and Joint Consultation for Win-Win Results." Forums were held both online and offline in a format linking China and overseas, and over 300 guests from 15 countries and regions were invited. Exhibits from more than 130 companies were on display, and there was a flurry of announcements with more than 30 new products being unveiled for the first time at the conference.[66]

(b) World Artificial Intelligence Conference (WAIC) 2022 (three days from September 1, 2022, Shanghai): Jointly sponsored by the National Development and Reform Commission, the Ministry of Industry and Information Technology, the Ministry of Science and Technology, the Cyberspace Administration, CAS, the Chinese Academy of Engineering, CAST and the Shanghai city government, and was held at the Shanghai World Expo Center.[67] Under the theme of "Intelligent Connectivity, Infinite Multiverse," the conference brought together technologies such as the metaverse, digital twins, and spatial computing. Two sub-venues were also opened in Pudong and Xuhui, and five sub-venues were opened in North America, Europe, Singapore, South Korea, and Hong Kong. The exhibition area covers an area of 15,000 square meters, with more than 200 exhibitors, of which more than 30% were first-time exhibitors, and more than 40% of the exhibitors were from outside Shanghai and from overseas.[68]

In addition to the above, the following conferences were also held in 2022:

- ✓ Cooperation between China and the Central and Eastern European Countries (first time) (May 12, 2022)
- ✓ China International Big Data Industry Expo (May 26, 2022, Guizhou)
- ✓ 2022 World 5G Convention (August 10-12, 2022, Harbin City, Heilongjiang Province)
- ✓ 2022 Smart China Expo (August 22-24, 2022, Chongqing)
- ✓ World Internet Conference (October 31, 2022, Wuzhen)
- ✓ 2022 Global Industrial Internet Conference (November 8, 2022, Shenyang, Liaoning Province)
- ✓ 2022 World Conference on VR Industry (November 12-13, 2022, Nanchang City, Jiangxi Province)
- ✓ World Conference on Integrated Circuits 2022 (November 17, 2022, Hefei City, Anhui Province)
- ✓ AERO Asia (December 21, 2022, Zhuhai City, Guangdong Province)

66 Information from the JST Beijing Office and "World Robot Conference 2022 Opens, with More than 500 Robots on Display," Science Portal China, Science and Technology news, August 19, 2022, https://spc.jst.go.jp/news/220803/topic_5_01.html

67 "World Artificial Intelligence Conference 2022 to be held in Shanghai, Demand for AI Talent will Increase," JETRO Business Bulletin, September 5, 2022, https://www.jetro.go.jp/biznews/2022/09/5d8fb8c3ed6378fe.html

68 "World Artificial Intelligence Conference 2022 Begins, Gathers Metaverse Technologies," Science Portal China, Science and Technology News, September 2, 2022, https://spc.jst.go.jp/news/220901/topic_5_02.html

(2) Professional international research meetings organized by international academic societies, etc.

Professional international research conferences vary in size, and, due to historical circumstances, their importance for researchers is not uniform. Historically, however, conferences for many years have primarily been held in Europe and the United States to bring together experts in specific fields to discuss cutting-edge research issues, and participating in these conferences, or even more so giving an invited lecture, is considered an honor and an indication of a researcher's cutting-edge research. As such, it is extremely important to know which countries, institutions, and researchers are leading in a particular field of research by keeping track of the trends of the researchers invited to these conferences.

The Materials Research Society (MRS) is an international academic society comprised of approximately 14,000 researchers in the materials field, and it holds conferences in the United States each spring and fall. Here, MRS trends from the spring of 2023 will be cited, based on information compiled by the JST Evidence Analysis Office.[69]

This MRS conference consisted of 8 top-level clusters, 59 symposium sessions, and a total of 1,159 presentations. Looking at the number of lectures and the countries that they belong to, there were 586 from the United States, 80 from China, 70 from the United Kingdom, 63 from Germany, 43 from Japan, and 31 from France, so China ranked second in terms of the number of lectures (approx. 7%).At the fall 2022 MRS conference, apart from the United States, there were 63 from Germany, 49 from China, and 46 from the United Kingdom, so the number of lectures from China significantly increased during this period. By field, excluding the United States, in energy and environmental China ranked second with 7% (the same as the United Kingdom, also at 7%); in bio and soft materials China ranked third with 7% (after the United Kingdom with 8%); in electronics and photonics China ranked second with 8%; and in nanomaterials China ranked third with 7% (after Germany with 7%). Looking at invited lectures in particular, China ranked second with 7% after the United States in both new structures, in new functional materials, and in processing. Furthermore, speakers are proposed for each symposium session by an organizer that is composed of four key researchers, and the countries that the organizers belong to are extremely important. For the spring MRS conference, there were a total of 235 organizers, and, excluding the United States (with 123 organizers), fifteen were from the United Kingdom, and then ten each from Germany, the Netherlands, South Korea, and China. In any case, looking at the trends in the number or organizers every five years since 1996, remarkable growth has been shown by both China and South Korea.

As noted above for MRS, there are some historical and long-standing conferences that have been held as extremely private gatherings of prestigious researchers, even though they are not large-scale professional international research conferences.[70] The Gordon Research Conferences are among the most famous of such gatherings. Originally organized

69 Sigma Evidence, 2022 No. 36 (Vol. 86), March 31, 2023, Evidence Analysis Office, Σ Team, https://www.jst.go.jp/jst_portal/office/place_de_levidence/doc/sigma_report36_2023.pdf

70 "China, India, and South Korea in the Scientific Community," "Japan, China, India, and Korea in the Scientific Community," JST Evidence Room materials https://jst20.sharepoint.com/sites/keieikikaku/DocLib/%E3%82%A8%E3%83%93%E3%83%87%E3%83%B3%E3%82%B9%E5%88%86%E6%9E%90%E5%AE%A4/%E3%83%97%E3%83%A9%E3%82%B9%E3%82%A8%E3%83%93%E3%83%87%E3%83%B3%E3%82%B97/plasevidence-7_20230320_low_Ch2.pdf

by Dr. Neil Gordon of John Hopkins University in 1931, it is a significant honor for a scientist to be an invited speaker[71] at one of these meetings. Although no statistical figures are available on attendance at Gordon Research Conferences, Chinese scientists (one from Peking University and one from the University of Hong Kong) were selected to join the fifteen-member Board of Trustees and the twelve-member Conference Evaluation Committee (these bodies have no Japanese members).[72]

In the life sciences field, the Cold Spring Harbor Meetings, founded in 1890, are famous.[73] The Cold Spring Harbor Meetings, also known as the "cradle of molecular biology," are held every month on Long Island, New York, with a theme for each session,[74] and some of the participants have even gone on to become Nobel Prize winners. Here again, the number of invited lecturers from China is increasing. In 2010, a Cold Spring Harbor branch was established in Suzhou, China, the only branch outside of the United States, and Asian meetings have been held there.

Although not participants of professional international research conferences, there is also a study that looked at the number of Principal Investigators (PIs) at the Scripps Research Institute, the Salk Institute for Biological Studies, and the La Jolla Institute for Immunology in the La Jolla area on the West Coast of the United States. According to this study, the number of Chinese PIs at the Scripps Research Institute is by far the largest (10 out of 184); at the Salk Institute there is about the same level of PIs from Japan, China, India, and South Korea; and at the La Jolla Institute India stands out. Since the beginning of the 2010s, the American Physical Society has also seen an increase in the number of invited speakers from China.

There are a large number of international research conferences in specialized fields, and they vary depending on the field and scope. it is difficult to get a relatively accurate picture of where such international academic conferences (including research conferences with names such as "world conference") will be held, but Nikkei Medical has published a comprehensive schedule for medical-related conferences.[75] According to it, the only international conference in China during 2023 was the 8th International Symposium on Meniere's Disease and Inner Ear Disorders (meniere2023) (Shanghai, April 2023).

The following is a list of conferences hosted by China that are in "Research Report on Invitation Lectures and Keynote Lectures at International Academic Meetings and Conferences" that was compiled by the JST Center for Research and Development Strategy (CRDS) for the purpose of understanding cutting-edge science and technology trends in 2022.[76]

The International Conference on Data Science and Information Technology is an international conference held by the Association for Computing Machinery (ACM) and ACM Special Interest Groups (SIGs), and hosts more than 170 computing conferences, workshops, and symposiums around the world. These events vary in size, from small workshops to conferences attended by tens of thousands of people, but they reflect the cutting-edge of their respective fields, bring together renowned experts from a wide range of fields, present cutting-edge research papers

71 Gordon Research Conferences generally consist of a plenary lecture, a keynote lecture, and an invited lecture, and the invited lecture is also considered to be an academic achievement.

72 Refer to: https://www.grc.org/about/

73 Refer to footnote 30

74 Refer to: https://www.cshl.edu/

75 Refer to: https://medical.nikkeibp.co.jp/inc/all/gakkai/kaigai/#january

76 "Research Report on Invitation Lectures and Keynote Lectures at International Academic Meetings and Conferences (March 2023)," JST/CRDS

at conferences, and have them publish them in the proceedings. Many of these conferences have achieved preeminent status in their fields and attract participants from all over the world. The 4th conference was held in Shanghai, China from July 23 to 25, 2021. The event is sponsored by The International Society for Applied Computing (ISAC), Tokyo University of Science in Japan, and Cisco Networking Academy.

For robotics, the International Conference on Control and Robotics Engineering (ICCRE) is a forum for presenting the latest research results in control engineering and robotics, sponsored by the IEEE and led by Chinese and Japanese universities. The 7th ICCRE meeting was held in 2022 in Beijing, China.

For quantum information, the Quantum Information Processing (QIP) conference is held for this rapidly developing research field that spans both physics and computer science, extending information processing (including computing and encryption) into the physical realm, where quantum effects become important. QIP is also the largest annual conference in the field, with approx. 300 researchers participating. The 2020 conference was held in China, but no specific information was provided.

Due to the spread of COVID-19 since the end of 2019 and the beginning of 2020, the movement of people around the globe was restricted and many international research meetings moved online, which has made it difficult to follow up on the status of such international research conferences. It is important to conduct research to see how the overall picture will change over time while taking into account that there was such a unique period.

7 International Organizations

Since 1971 when China, or the People's Republic of China, secured a permanent seat on the UN Security Council, in general China has had consistently increasing participation in international organizations, not just those limited to science and technology fields (see chart below). China is now second only to the United States in contributing to the United Nations, and among the permanent members of the UN Security Council it dispatches the largest number of UN peacekeeping forces (approx. 2,500).

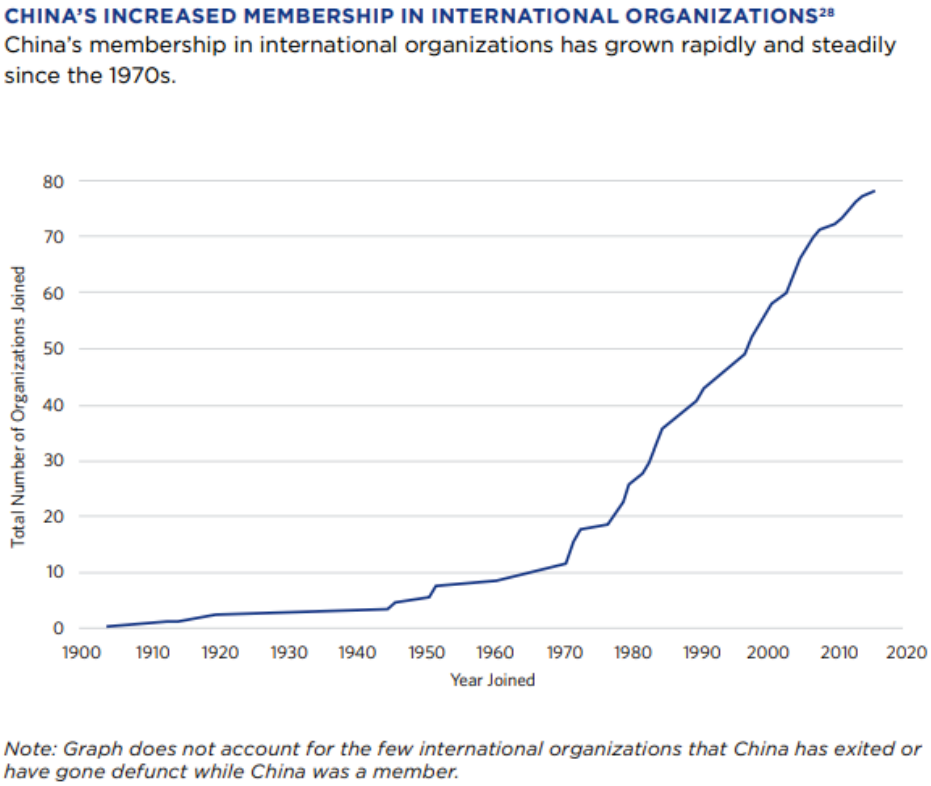


Figure 7: Change in the number of Chinese nationals participating in international organizations

Source: Kristine Lee and Alexander Sullivan, Center for a New American Security (CNAS), "People's Republic of the United Nations", ASIA-PACIFIC SECURITY | MAY 2019

(1) Specialized United Nations agencies

A point about China's presence that is commonly discussed is its number of top officials or staff in international organizations. Although it is difficult to obtain comprehensive statistics, in March 2021 the National Diet Library's Research and Legislative Reference Bureau compiled a report on "China's Influence on International Organizations," wherein it analyzed the Xi Jinping administration's emphasis on the United Nations and China's efforts to secure top positions in international organizations, and compiled cases where specialized United Nations agencies are said to

be influenced by China.[77] At the time of the report, Chinese nationals headed four of the fifteen specialized United Nations agencies: the Food and Agriculture Organization of the United Nations, the International Civil Aviation Organization (ICAO),[78] the International Telecommunication Union (ITU),[79] and the United Nations Industrial Development Organization (UNIDO)[80] (as of April 2023, the FAO is the only organization in which a Chinese national occupies the top position, and no Chinese candidate has been elected to head any of the other agencies that have been up for election). As for Japan, after Yukiya Amano served as the Director General of the International Atomic Energy Agency (IAEA) from 2009 to 2019, Masahiko Metoki (former Managing Executive Officer of Japan Post Co., Ltd.) was appointed Director General of the Universal Postal Union (UPU) in August 2021,[81] marking the first time in quite a while that a Japanese national had been appointed as the head of a United Nations-related organization.

As has already been mentioned, China's policy documents, such as the "National Medium- and Long-term Program for Science and Technology Development (2006-2020) (MLP)" actively promote involvement and participation in international organizations, such as "Actively participating in international scientific projects and academic institutions" and "Helping Chinese scientists assume leadership positions in important international academic institutions," and the CAS also has a policy of "serving in international scientific organizations to increase appointments and influence." The goal to "establish global research funds" also appears to be on the agenda,[82] and it remains to be seen whether or not an international foundation other than ANSO, which was established through the Belt and Road Initiative described below, will be established.

Although it is difficult to trace when this policy was first articulated and put into practice, China's emphasis on the United Nations is said to have begun in 2003, when Shi Jiuyong, who served as the Chinese government's legal representative and was involved in negotiations between China and the United Kingdom regarding Hong Kong, became the first Chinese national to be President of the International Court of Justice (ICJ) at the United Nations,[83] and it is well known that in 2007, Hong Kong-born Margaret Chan (Fung Fu-chun) was appointed as the Director-General of the WHO.[84] Following the progress since then, as shown in the above report, in January 2015 Houlin Zhao

77 Ayaka Yamamoto, National Diet Library Research and Legislative Reference Bureau Foreign Affairs and Defense Division, National Diet Library, "Research and Information – ISSUE BRIEF—", Vol. 11144, No. 1144 (March 26, 2021), "China's Influence on International Organizations -- Focusing on Moves to Acquire Top Positions at Specialized United Nations Agencies" https://dl.ndl.go.jp/view/download/digidepo_11651162_po_1144.pdf?contentNo=1

78 Juan Carlos Salazar of Columbia was elected as Secretary General in the August 2021 election: https://www.icao.int/secretariat/SecretaryGeneral/Pages/default.aspx

79 Doreen Bogdan-Martin of the United States was elected as Secretary-General in the September 2022 election: https://www.itu.int/en/osg/Pages/biography-itu-sg-doreen.aspx

80 Gerd Müller of Germany was elected as Director General in the December 2021 election: https://www.unido.org/about-us/leadership

81 Ministry of Internal Affairs and Communications press materials, "Statement by the Minister of Internal Affairs and Communications: Results of the Election for the Director General of the Universal Postal Union (UPU)", August 25, 2021, https://www.soumu.go.jp/menu_news/s-news/01ryutsu15_02000042.html

82 At the 3rd Group Study Session of the Central Political Bureau held in July 2023, General Secretary Xi Jinping reiterated the idea of "establish[ing] a research fund for the world" as part of strengthening basic research, with a particular emphasis on climate change. Refer to: https://www.gov.cn/yaowen/liebiao/202307/content_6895642.htm

83 Masatoshi Fujitani, Policy Recommendation Committee Member and former Director of the Kanazawa Office of the Public Security Intelligence Agency, "China's Dominance of the UN and Targeted Posts at Specialized UN Agencies," Japan Forum for Strategic Studies, https://www.jfss.gr.jp/article/1600

84 Subsequently, in the spring 2017 election for WHO Director-General, Tedros Adhanom of Ethiopia, with Chinese support, defeated David Nabarro of Britian (133-50) and became the first WHO Director-General without medical qualifications. For more information, refer to Bill Powell, "How America Ceded the WHO to China," Newsweek, April 21, 2020, https://www.newsweekjapan.jp/stories/world/2020/04/who-46.php

became Secretary-General of the International Telecommunication Union, in August 2015 Fang Liu became Secretary General of the International Civil Aviation Organization (ICAO), and in June 2019 Qu Dongyu became Director-General of the Food and Agriculture Organization of the United Nations. It is worth remembering that in March 2020, a Chinese candidate was defeated in the election for Director General of the World Intellectual Property Organization (WIPO).

The next section will focus on the Alliance of International Science Organizations, which is a China-led international organization in the science and technology field, and will also discuss other international organizations with a focus on science and technology.

(2) Alliance of International Science Organizations (ANSO)

1. Overview

The Alliance of International Science Organizations (ANSO) was established in 2013 as part of the Belt and Road Initiative, with President Xi Jinping stating, "We will strengthen international cooperation in science and technology with countries along the Belt and Road and build a community of human civilization." In November 2016, in order to realize this vision, the First International Science Forum of National Scientific Organizations on the Belt and Road Initiative was held in Beijing, and it began with the adoption of the Beijing Declaration,[85] which aims to build a more comprehensive framework to support science, technology, and innovation along the Belt and Road, but also in other regions. Subsequently, the organization's articles of incorporation were discussed in 2017, and ANSO was officially established as a non-governmental organization in November 2018.

According to the ANSO website, there are currently 67 members from 48 countries and regions, including 27 national science academies, 23 universities, 10 national research institutes, and 7 international organizations. At the October 2021 Governing Board Meeting, eight institutions from Ecuador, Cuba, Serbia, Argentina, Malaysia, and Spain were approved to participate.

ANSO's vision is to be an international scientific organization with a global impact in guiding and implementing initiatives and actions in specific innovation programs and Science, Technology, Innovation and Capacity Building (STIC) so as to promote shared development and advance the United Nations SDGs.[86] The distinctive wording here is the use of the "STIC" instead of "STI", which seems to emphasize the uniqueness of ANSO's focus on human resource development. With a general principle of "unified consultation, joint efforts and sharing," ANSO members are national science academies, universities, research institutes, and international organizations. ANSO's primary activities include bestowing awards for international cooperation, conducting training, education, and capacity building, and economic development through the integration of innovation, technology, and marketization. In particular, ANSO also includes standards and the protection of intellectual property, which are quite pragmatic in nature.

[85] The relevant part of the Beijing Declaration: "more comprehensive framework to support the international cooperation on science, technology and innovation along the Belt and Road and other regions as well." The forum was attended by 350 scientists from 40 countries (including two Nobel laureates and 30 academicians). Refer to: http://www.anso.org.cn/about/history/

[86] "To become an international science organization of global impact in catalyzing and implementing concrete innovative programs, initiatives and actions in Science, Technology, Innovation and Capacity Building (STIC) for the promotion of shared-development and the advancement of the UN Sustainable Development Goals (SDGs)."

According to the 2022 ANSO Annual Report, the October 2021 Governing Board Meeting proposed a 2022 action policy of encouraging participation in international conferences related to the promotion of SDG-related basic research; establishing joint financial support mechanisms with ANSO member countries and their funding institutions; expanding partnerships with industry to strengthen related support; establishing regional offices both inside and outside of China; and expanding ANSO membership.

2. Organization and management

The current ANSO President is Chunli Bai, President of the CAS, and the ANSO Vice Presidents are Alexander Sergeev of the Russian Academy of Sciences and Narong Sirilertworakul of the National Science and Technology Development Agency of Thailand.[87] ANSO is managed by a General Assembly, a Governing Board that includes a President and Vice Presidents, and a Secretariat. The Secretariat is located in Beijing and consists of the following divisions: General Affairs and Personnel, Information and Communication, Science Planning and Consultation, Capacity Building and Training, and Finance; there are 15 administrative staff (full-time equivalent) (ANSO has also formed cooperative relationships with domestic universities for human resources support). Actual expenditures in 2021 were 91 million RMB (approx. 182 million JPY) (20 million RMB in 2020), and the proposed budget for 2022 is 147 million RMB (approx. 294 million JPY) (70 million RMB in 2021, with a note stating that this amount does not include the budget for scholarships). Contribution amounts or percentages from member countries and institutions could not be found in the annual report (see below for scholarships). However, in addition to its regular budget, there is also an "STIC Endowment," and, according to the 2022 ANSO Annual Report, 50 million RMB (50 million RMB in 2020) is provided by overseas Chinese charity foundations. The purposes and uses, etc. are not specifically indicated (this endowment can also be found in TWAS, which will be described later).

The organization's primary specific activities are ANSO Fellowships and ANSO Scholarships, ANSO Prizes, ANSO Training Programs, ANSO Collaborative Research, and the ANSO Coalition (a framework for supporting cooperation on specific issues such as disaster prevention and environmental issues). ANSO also additionally holds workshops and other events from time to time. In 2023, emphasis was placed on training and technology transfers in the areas of development technologies, including agriculture, medicine, and disaster prevention, particularly those associated with the Belt and Road.

87 Refer to: http://www.anso.org.cn/events/generalAssembly/202204/t20220407_693876.html

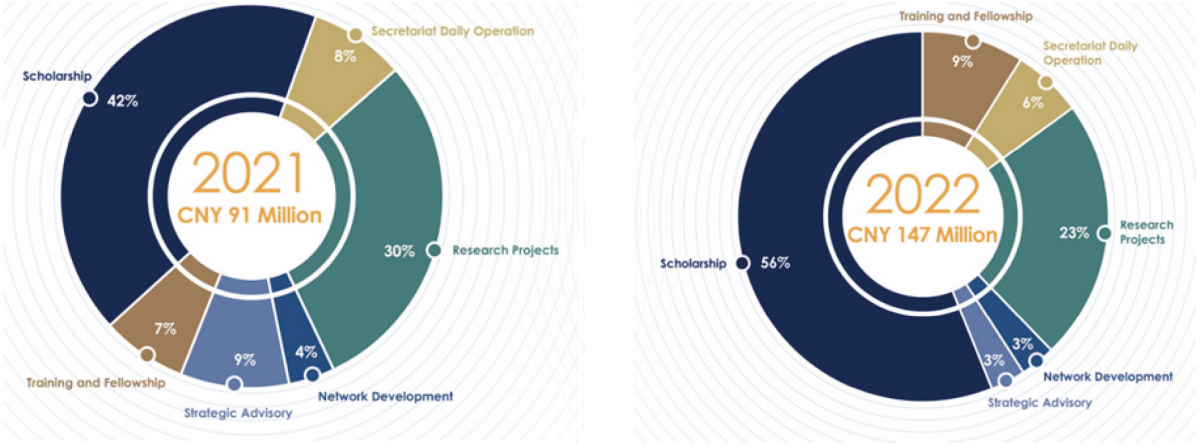


Figure 8: ANSO's 2021 expenditure results and 2022 budget proposal

Source: ANSO Annual Report 2021[88]

The ANSO is also enthusiastic about human resource development activities, and one of its most notable recent programs is training in "synthetic biology." This training is aimed at industrial applications of synthetic biology, and includes courses on technologies, experimentation, and industry, etc., is aimed at young researchers from ANSO member countries as well as COMSATS member countries, and has been implemented since December 2022. The CAS Tianjin Institute of Industrial Biotechnology is responsible for implementing the trainings, with support from TWAS. COMSATS (Commission on Science and Technology for Sustainable Development in the South)[89] is a so-called South-South cooperative framework established in 1994 that aims for economic development through the appropriate application of science and technology, and is an intergovernmental organization that has 27 member countries. Its headquarters are located in Islamabad, Pakistan.

3. Main activities: Scholarship management status

One of ANSO's main activities for human resource development is through its scholarship program, which, at 42% of total expenditures and 56% of total budget, accounts for a large proportion of ANSO's funds. This program, which can be described as support for young human resources, provides scholarships for 200 master's degree students and 300 doctoral degree students each year. Although TWAS/UNESCO cover some of the travel expenses for this study abroad fee support, the Chinese government covers accommodation expenses (6,000 to 7,000 RMB per month) and university registration fees, with the destination institutions being the University of Science and Technology of China (USTC) and the University of the Chinese Academy of Sciences (UCAS).[90] All international students are required to pass the Chinese language training and Chinese culture training provided by the Chinese government.

88 http://www.anso.org.cn/publications/reports/202204/P020220406501440377559.pdf

89 Refer to: https://thecommonwealth.org/organisations/commission-science-and-technology-sustainable-development-south-comsats
COMSATS is an intergovernmental organization established in 1994 that consists of 27 member countries and belongs to the so-called Global South. The Secretariat is in Islamabad, Pakistan: https://thecommonwealth.org/organisations/commission-science-and-technology-sustainable-development-south-comsats#:~:text=The%20Commission%20on%20Science%20and,its%20Secretariat%20in%20Islamabad%2C%20Pakistan.

90 The ANSO Scholarship for Young Talents, 2023 Call for Applications, http://www.anso.org.cn/programmes/talent/scholarship/

The statistics on the number of successful applicants for this scholarship, announced on the ANSO website, are as follows.

In 2022, the third year of the program's establishment, a total of 184 master's degree students received study abroad financial support, with 46 going to USTC and 138 going to UCAS. The international students at USTC came from 21 countries, with 17 from Pakistan, 4 from Yemen, and about 1 from most other countries. The international students at UCAS came from 27 countries, with Pakistan at the top again with 62 students, followed by Nigeria with 18, Kenya with 10, Sri Lanka with 10, Bangladesh with 6, Uzbekistan with 4, and about 1 from most other countries.[91] In this way, approx. half of the benefits are going to Pakistani students.

In 2022, a total of 300 doctoral students received study abroad financial support, with 110 going to USTC and 190 going to UCAS. The international students at USTC came from 31 countries, with 51 from Pakistan, followed by 4 from Ethiopia, 4 from Yemen, and 4 from Bangladesh. The international students at UCAS came from 30 countries, with 69 from Pakistan, followed by 19 from Rwanda, 15 from Kenya, 12 from Nigeria, 11 from Ethiopia, and 9 from Bangladesh.[92] From 2022, this scholarship for doctoral students is called the "ANSO-CAS-TWAS/UNESCO PhD Scholarship awardees," and TWAS and UNESCO will cover travel expenses and various procedural costs.

Looking at these trends, in 2022 international students from Pakistan accounted for a very large proportion of the awardees, then followed by Nigeria, Ethiopia, Bangladesh, and Sri Lanka. From these results alone, it can be seen that the situation is not one in which human resource development effects are expected for a very broad region, but rather that the activities are highly influential or concentrated on a certain group of countries, depending on the qualifications of the applicants. It should also be noted that data prior to 2021 are not available; only the data for 2022 is available.[93]

It will be very interesting to see how the balance of countries receiving aid changes over the years.

(3) International Technology Transfer Network (ITTN) and the ITTN International Committee

The International Technology Transfer Network (ITTN) was established in January 2011 under the direction of the Ministry of Science and Technology for the purpose of promoting international science and technology cooperation through strategic technology transfers and science and technology diplomacy. The ITTN collaborates with 610 international technology transfer organizations and 168 think tanks in 35 countries around the world.

According to the ITTN webpage,[94] it has established and operates eleven locations within China as well as nine overseas sub-centers and representative offices, and operates the "ITTN International Committee" with the participation of influential leaders. The nine overseas sub-centers are located in the United States, Italy, Germany, the United Kingdom, Slovenia, Finland, Malaysia, and South Africa, and, from these centers, approx. 3,000 projects are carried out each year. In order to strengthen third-party institutions for technology transfers, ITTN, with the support of the Ministry of Science and Technology, trains, certifies, and examines Chinese international technology transfer

91 http://www.anso.org.cn/programmes/talent/scholarship/202210/W020221020534835890677.pdf

92 http://www.anso.org.cn/programmes/talent/scholarship/202210/W020221020534835907691.pdf

93 For 2021 it was reported that more than 6,000 applications (more than 4,000) were received from more than 110 countries (more than 100 countries) (figures for 2020 applications are in parentheses).

94 http://www.ittn.com.cn/article/1

managers based on the APEC Technology Transfer Guidelines. Currently, ITTN is said to be the only professional organization in China that certifies this type of expert at the national level, and in 2014 these trainings were held in nearly 30 cities in China.

In 2018, ITTN was jointly approved by the Department of International Cooperation of the Ministry of Science and Technology and the Torch High Technology Industry Development Center to develop high-tech industrial technologies, and has become a base for international science and technology cooperation at the national level. ITTN's international technology transfer centers include 45 international science and technology cooperation bases across China, which provide internationalization, technological innovation, and platform services, and that operate and develop through market-oriented mechanisms.

The Ministry of Science and Technology and ITTN Yunnan Province established the BRICs Technology Transfer Center and enacted the BRICs Technology Transfer Plan 22-24, the main content of which is protecting intellectual property, expanding opportunities for technology transfer, promoting education and training, and developing technology transfer indicators.

The aforementioned ITTN International Committee is said to be ITTN's global think tank and to work closely with the ITTN Secretariat to promote international technology transfers between China and the committee's member countries. The ITTN International Committee is chaired by Andy Sierakowski (Former Chairman of Knowledge Commercialization Australia (KCA)).

Since its inception, ITTN has organized resource channels for innovative technology projects, personnel, and institutions abroad; has developed international scientific and technical cooperation; has facilitated innovation planning with a global perspective; and via the ITTN International Committee has brought together 168 influential leaders on technology transfer from 35 countries and 610 international technology transfer organizations (detailed membership information has not been disclosed).

Recent events include "The Online Roadshow and Matchmaking of International Innovative Technology Against COVID-19 & Launching Open Innovation Network for Technology and Entrepreneurship Communication Hub (OnTech)" hosted by the China Centre for International Science and Technology Exchange (CISTE) and ITTN in March 2020.[95]

(4) United Nations Industrial Development Organization (UNIDO)[96]

UNIDO (United Nations Industrial Development Organization) is a specialized United Nations agency that promotes inclusive and sustainable industrial development in developing countries and in countries transitioning to market economies, and is an organization supporting the sustainable economic development of these countries. Inclusive industrial development industrial development that equitably benefits all people and reduces poverty, and sustainable industrial development means industrial development that achieves both economic development and environmental protection.

95 http://www.ittn.com.cn/article/19

96 Report on International Research Projects for Building an Integrated Economic Growth Strategy in FY2021 (Research on Human Resources Development in the Chinese, German, and South Korean manufacturing industries), March 2020, Mitsubishi UFJ Research & Consulting, http://www.unido.or.jp/about_us/unido/

UNIDO was established in 1966 as a division of the United Nations, became independent in 1985 as the 16th specialized United Nations agency, and currently has 170 member countries. Headquartered in Vienna, Austria, it has regional offices in 49 countries, liaison offices in three cities, and investment and technology transfer promotion offices in nine cities in eight countries (Beijing and Shanghai in China). The Director General is Gerd Müller from Germany (elected on December 10, 2021). Li Yong from China was the previous Director General (2013-2021).

From 2017 to 2021 China ranked fifth in contributions to UNIDO. China is an important partner for UNIDO, and they have a strong collaborative relationship.

UNIDO's relationship with the Chinese government originally began with UNIDO China's support to China (starting with the development of south funded projects, that is, UNIDO's technical cooperation projects funded by China, in China). Subsequently, diversification progressed with the establishment of the China International Development Cooperation Agency (CIDCA), the Chinese government's active involvement in multilateral systems such as the United Nations, and the regular provision of budgets to UNIDO. Currently, the number of China-funded projects is increasing, primarily in Africa. UNIDO implemented the "Leather Initiative for Sustainable Employment Creation (LISEC)" project (2018-2022) in Ethiopia by using contributions from China and the EU. The project's budget was 8.36 million USD, and the LISEC project also receives support from the German government through the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ),[97] providing comprehensive and systemic support. The project's purpose is to create employment opportunities for young people by developing Ethiopia's leather industry and the Modjo Leather City. UNIDO is aiming to strengthen the competitiveness of the country's leather industry by supporting the leather value chain from raw hides to tanneries (including technology, training, and awareness to improve both the quality and quantity of leather).

(5) United Nations Educational, Scientific and Cultural Organization (UNESCO)

In June 2016, the International Centre for Higher Education Innovation (ICHEI)[98] on the campus of Southern University of Science and Technology in Shenzhen was certified as a UNESCO Category 2 Centre.[99] ICHEI aims to promote digital transformation in developing countries in Asia and Africa by leveraging Shenzhen's ICT development experience, and claims to contribute to Goal 4 of the SDGs (high-quality education for all). Its main missions are as follows:

(a) Knowledge production: Provide policy advice on higher education innovation to Asia-Pacific and African countries

(b) Capacity building: Strengthen the capacity of teachers with an eye toward improving the gender balance in ICT

97 Refer to: https://volunteer-platform.org/words/development-cooperation/deutshe-geselleschaft-fuur-internationale-zusammenarbeit/

98 UNESCO resolved to contribute to ICHEI at its 38th General Assembly, held on November 13, 2015. Refer to: https://en.ichei.org/dist/index.html#/OurSite?nid=2

99 A UNESCO Category 2 Centre is an institution that conducts programs in cooperation with UNESCO. Although it is an independent organization from UNESCO, it has been recognized by the UNESCO General Assembly as an organization that cooperates with UNESCO. There are Centres in fields such as education, natural sciences, information and communications, and culture. Incidentally, Category 1 is a position within UNESCO itself, and TWAS, which is also introduced in this report, falls under this category. Refer to: https://www.unesco.org/en/natural-sciences/centres

education

(c) Technical support: Strengthen partnerships with ICT companies and provide professional and technical advice and opportunities for research cooperation to stakeholders in developing countries

(d) Information sharing: Provide a platform for information sharing through regularly sending reports and newsletters

There are several categories of UNESCO regional offices. Country offices are located in several countries such as Vietnam, Cambodia, Pakistan, and Afghanistan, and, from a global perspective, are rather exceptional. Essentially, UNESCO's cluster office system is centered around covering multiple neighboring member countries. Taking Asia as an example, the Beijing office is a cluster office with jurisdiction over China, Japan, South Korea, North Korea, and Mongolia.[100]

(6) Food and Agriculture Organization of the United Nations (FAO)[101]

Since the FAO's establishment of the South-South Cooperation Programme with China in 1996, China has actively participated, sending Chinese experts to Africa, Asia, the Caribbean, and the South Pacific via the FAO. In May 2006, the FAO signed a Letter of Intent with the Chinese government, agreeing to dispatch at least 3,000 Chinese experts over a six-year period to help improve the productivity of small-scale farmers in developing countries. In 2009, the Chinese government contributed 30 million USD to the FAO-managed South-South Cooperation Assistance Fund, and in 2015 made a new contribution of 50 million USD to improve food security and to promote sustainable agricultural development. Furthermore, China has a contribution proportion of 12%, which is second only to the United States at 22%.

In June 2019, Chinese national Qu Dongyu was elected as the 19th FAO Director-General (2019-2023) (108 out of 191 votes), and he was then reelected in July 2023 (his term will end in July 2027).

Through technical assistance provided by the FAO under the South-South Cooperation Programme with China, host countries gain experience and expertise in agricultural production in China, and the FAO holds specialized training courses in China to strengthen the capacity of people in developing countries. Furthermore, the FAO provides support for organizing and managing China's establishment of an international agricultural training center.

(7) United Nations Development Programme (UNDP)

China, Cambodia, and the UNDP launched a tripartite cooperative partnership for a cassava project in 2011, and in phase 1 (December 2011 to January 2012) providing cassava production training to 30 agricultural experts from the Cambodian Ministry of Agriculture, Forestry and Fisheries. Following the success of phase 1, with the goal improving the livelihoods of 200,000 farmers in Cambodia, phase 2 (May 2013 to March 2015) conducted a needs assessment,

[100] Yoshihiro Higuchi, JST Counselor (International Strategy), "Activities in the Asia-Pacific Region -- (4) UNESCO's Science Initiatives," February 24, 2023, Science Portal Asia Pacific, Refer to: https://spap.jst.go.jp/other_asia/experience/2023/topic_et_16.html

[101] Regarding China's international human resource development projects at FAO, UNDP, the World Bank, etc., the above-quoted report is from the Report on International Research Projects for Building an Integrated Economic Growth Strategy in FY2021 (Research on Human Resources Development in the Chinese, German, and South Korean manufacturing industries).

performed environmental research, created training manuals, and held business matching exercises, as well as providing assistance to address the challenges of cassava production in Cambodia and to promote cassava exports to the Chinese market.

(8) World Bank (WB)

The World Bank is attempting to transfer the know-how of its vocational education institute in Ningbo, China to Africa. As part of PASET (Partnership for skills in Applied Science, Engineering and Technology),[102] African countries are aiming to revitalize their TVET[103] systems with support from the World Bank. From August to September 2018, TVET experts participated in discussions at the 2nd Africa-China-World Bank Education Partnership Forum held in Beijing and Ningbo, which was funded by the China World Bank Partnership Facility (CWPF).[104]

With regards to the World Bank, Shaolin Yang serves as Managing Director and World Bank Group Chief Administrative Officer (CAO).

(9) Asian Development Bank (ADB)

The Asian Development Bank (ADB) and the Chinese Ministry of Finance established the PRC-ADB Knowledge Sharing Platform in 2008. In August 2012, the Regional Knowledge Sharing Initiative (RKSI)[105] was launched with the aim of conveying China's experience of economic growth and change over the past 40 years, and in September 2012 the Chinese Ministry of Finance collaborated with ADB to co-host the High-Level Forum on South-South Knowledge Cooperation. Approx. 40 people from 16 countries, primarily in Asia (including Japan/JICA), and two international organizations participated in the forum.[106] Recently, it has been developing multifaceted activities in fields such as medicine, digital, energy, and communications.

In order to support the ADB's poverty reduction, regional cooperation, and knowledge sharing efforts in developing countries in the Asia-Pacific region, China established the Reduction and Regional Cooperation Fund in March 2005 with funding from the Chinese government. The fund is also used to share China's experience and knowledge on poverty reduction and development processes, and to support the development of human resources. As of the end of December 2022, the Chinese government has contributed 90 million USD, of which 74.19 million USD was allocated to 123 projects.[107]

[102] PASET is a project launched in 2013 to develop activities to strengthen scientific and technological capabilities with the aim of socio-economic development in African countries and in the sub-Saharan region. Refer to: https://www.worldbank.org/en/programs/paset

[103] TVET (Technical and Vocational Education and Training) is understood to be part of both the universal right to education and the right to work that were established by UNESCO at its General Assembly in November 2011, and is a program for education, training, and skills development.

[104] Refer to: https://www.worldbank.org/en/programs/china-world-bank-group-partnership-facility

[105] Refer to: https://rksi.adb.org/about-us/

[106] Refer to: https://rksi.adb.org/category/events/conferences-forums/

[107] Refer to: https://www.adb.org/what-we-do/funds/prc-regional-cooperation-and-poverty-reduction-fund

(10) BRI International Green Development Coalition

The BRI International Green Development Coalition (BRIGC)[108] was officially launched in 2019, and, in June 2021, 29 countries jointly advocated for the Belt and Road Green Development Partnership Initiative the Asia and Pacific High-level Conference on Belt and Road Cooperation. This is a clear demonstration of the international community's sympathy and support for the idea of green development, and 39 major international finance institutions around the world participated in the Green Investment Principle (GIP) for the Belt and Road Initiative.

(11) Other international organizations led by or linked to China

The following is a summary of international organizations that China leads or is involved with.

The known international organizations who secretariat headquarters are located in China are as follows:

(a) Shanghai Cooperation Organization (SCO)[109] (Beijing)

(b) United Nations Centre for Sustainable Agricultural Mechanization (CSAM)[110] (Beijing)

(c) International Geonumerical Society (Beijing)

(d) BRICS New Development Bank (Shanghai)

(e) Asian Infrastructure Investment Bank (AIIB) (Beijing)

(f) United Nations Educational, Scientific and Cultural Organization (Shanghai)

(g) International Bamboo and Rattan Organization (Beijing)[111]

(h) Boao Forum for Asia (Beijing)

In 2023, Hong Kong plans to establish an international mediation board in Hong Kong,[112] and has applied to join the DEPA digital trade agreement.

According to the Ministry of Science and Technology's remarks at the 2022 Zhongguancun Forum,[113] China already participates in more than 200 international organizations and has more than 1,200 experts who hold executive

108 Refer to: http://en.brigc.net/

109 Refer to: http://eng.sectsco.org/

110 The Center for Sustainable Agricultural Mechanization (CSAM) was established in 2002 as a subsidiary organization of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), and is cone of the ESCAP regional committees. As an organization it specializes in sustainable agricultural mechanization with the aim of economic and social development in the Asia-Pacific region, and aims to further develop the region and solve a variety of social issues (such as hunger, poverty, the environment, and gender disparity issues) by promoting technical cooperation and establishing systems to promote economic exchanges. Refer to: http://www.unforum.org/internships/wp/2020/09/27/%e7%ac%ac86%e5%9b%9e%e3%80%80%e6%9b%be%e6%a0%b9%e7%90%86%e7%b4%97%e3%81%95%e3%82%93/

111 Founded in 1997, INBAR is the first intergovernmental international organization to be headquartered in China. It is the world's only international organization dedicated to the sustainable development of bamboo and rattan. Refer to: https://www.inbar.int/cn/about/

112 International mediation boards are treaty-based, intergovernmental international legal organizations that provide amicable, flexible, economical, and convenient solutions to a variety of international disputes via mediation services. A preparation room will be established in 2023. Refer to: https://japanese.cri.cn/2023/02/17/ARTITVb0OXXTmJ6Vy17wyiaV230217.shtml

113 In addition to remarks made at the Nakamura Forum above, this is based on the 2022 science and technology activities at the National Science and Technologies Activities Conference held on December 30, 2022 and on the achievements reported in promoting science, technology, and innovation since the 18th National Congress of the CPC that was held in 2012. [23-005] Overview of the 2022 National Science and Technology Activities Council, Beijing News, JST Beijing Office, January 19, 2023, Refer to: https://spc.jst.go.jp/experiences/beijing/bj23_005.htm and https://www.most.gov.cn/kjbgz/202212/t20221230_184140.html

positions in international organizations. It has scientific and technological cooperation relationships with more than 161 countries, and has concluded 116 intergovernmental scientific and technological cooperation agreements. As will be introduced later, China not only participates in more than 60 international projects, including the Square Kilometer Array Observatory (SKAO) project and the ITER (International Thermonuclear Experimental Reactor) project, but is deeply involved in these projects. Additionally, China also participates in more than 200 international organizations and multi-mechanisms and has joint support systems with 57 countries and international organizations. It has also actively participation in international cooperation activities related to COVID-19. It has held dozens of expert meetings with the United States, United Kingdom, and UNESCO, and conducted joint research on drugs, vaccines, and test kits with seventeen countries including Malaysia, South Africa, the United States, and the United Kingdom. China has established 53 Belt and Road joint laboratories, supported 3,500 young researchers coming to China for research, provided training to 15,000 overseas science and technology personnel, and supported more than 2,000 experts. The number of Chinese science and technology projects led by and involving foreign experts has significantly grown since the launch of National Key Technology R&D Program in 2015, reaching 183,000 Chinese and foreign co-authored papers in 2021. This is 1.5 times the number in 2015.

The following will add some information about Chinese nationals who play a leading role via other international organizations or their activities.

The 2020 44th session of the World Heritage Committee was held in Fujian Province, China, with Tian Xuejun, Vice Minister of Education, being selected as the Chairperson. The National Commission of the People's Republic of China for UNESCO is a committee comprised of the Ministry of Education, Ministry of Science and Technology, Ministry of Culture, CAS, Chinese Academy of Social Sciences, Ministry of Foreign Affairs, Ministry of Finance, and other related organizations, and it coordinates and provides advice on UNESCO-related operations.

Binying Wang is the Deputy Director General of the WIPO.[114] She has worked at the WIPO since 1992 and ran for WIPO Director General in 2020, but lost to Daren Tang of Singapore and became Deputy Director General.

In addition to the above, the Asia-Pacific Space Cooperation Organization (APSCO)[115] is an international organization that was independently proposed by China. Its charter was signed in 2005, and it was established in 2008. Its objectives include sharing satellite observation data among member institutions, joint research on observation technology, etc., and implementation of education and training plans. In addition to China, the member states are Bangladesh, Iran, Mongolia, Pakistan, Peru, Thailand, and Turkey (Indonesia has signed; Egypt is a supporting member; and Mexico and the Inter-Islamic network on Space Science and Technology (ISNET) are observers). The current Secretary-General (from November 2020 to October 2025) is Yu Qi from China, who draws on her experience in the United Nations Office of Outer Space Affairs. Ms. Qi is also the Deputy Director-General of International Cooperation Department at the China National Space Administration (CNSA). China operates the International Space Science Institute[116] under the CNSA; its Board of Trustees includes members from France, Switzerland, Spain, and the European Space Agency (ESA), and the Science Committee also includes members from France, Switzerland, Italy, Germany, the United States, Russia, Belgium, Canada, the United Kingdom, and Japan.

114 Refer to: https://www.wipo.int/about-wipo/en/activities_by_unit/index.jsp?contact_id=5

115 Refer to: http://www.apsco.int/

116 http://www.issibj.ac.cn/

As of November 2021, the Organization for Economic Co-operation and Development (OECD), which is a fairly Western-centered international organization, has 38 member countries. China is considered a key partner with India, Brazil, and other countries, and is said to be promoting cooperation through enhanced engagement programs.[117] In science and technology statistics, Chinese data is used as a reference and compiled in the same way as statistics from other member countries.

The OECD Nuclear Energy Agency (NEA) requires the participation of as many countries as possible in order to harmonize international nuclear safety regulations, but the participation of China and Russia has been the subject of debate since the mid-1990s. As of spring 2023, China is considered a strategic partner along with India, and Russia was a member but has been suspended since its invasion of Ukraine.[118]

Asia-Pacific Economic Cooperation (APEC) is not an international organization, but it is notable as it is currently undergoing fundamental changes and new developments in its framework. Although somewhat distant from science and technology, China contributes to the APEC Support Fund (established by Australia in 2005), which operates under APEC,[119] and receives support for the activities of the International Technology Transfer Network (ITTN) mentioned above.

In addition to personnel participation in international organizations, China also actively makes voluntary contributions such as donations, such as the below:

According to an announcement by the Ministry of Foreign Affairs on April 23, 2020, China donated $50 million ($20 million in March and $30 million in April) in two installments to the WHO to cover costs associated with COVID-19.[120] At a Foreign Ministry press conference in September 2021, China announced that it had already provided vaccine and material assistance worth 1.2 billion RMB to more than 100 national and international organizations.[121] In March 2023, China announced that it had decided to donate 200,000 euros through the International Atomic Energy Agency (IAEA) for safety measures at nuclear facilities in Ukraine.[122]

117 https://www.soumu.go.jp/g-ict/international_organization/oecd/index.html

118 https://www.oecd-nea.org/jcms/pl_36846

119 The fund is made up of voluntary contributions that are different from regular contributions, and includes China, Hong Kong (participating under the name "Hong Kong China"), South Korea, New Zealand, Russia, Singapore, and Taiwan (participating under the name "Chinese Taipei"). The United States also participates, and Japan contributes to the Energy Sub-Fund. https://www.mofa.go.jp/mofaj/gaiko/apec/qa_6.html

120 Reuters, "China to donate additional $30 million to WHO for COVID-19" (April 2020) https://www.reuters.com/article/health-coronavirus-china-who/china-to-donate-additional-30-million-to-who-for-covid-19-idUSB9N2BR01A/

121 Refer to: http://www.gov.cn/xinwen/2021-09/23/content_5638974.htm

122 Refer to the Saga Shimbun newspaper, "China Donates 20 million JPY to Ukraine" (March 2023) https://www.saga-s.co.jp/articles/-/1001356

8 International Projects

(1) The World Academy of Sciences

The World Academy of Sciences for the advancement of science in developing countries (TWAS) was founded in 1983 by scientists from developing countries, led by Pakistani Nobel laureate and physicist Abdus Salam, with the aim of strengthening science and engineering in developing countries. 2023 marks the 40th anniversary of its founding. Since its founding, TWAS's mission has been to overcome hunger, disease, and poverty through knowledge and skills. It is headquartered in Trieste, Italy (within the International Centre for Theoretical Physics (ICTP)) and receives strong support from the Italian government. As of early 2023, TWAS is comprised of 1,384 fellows[123] (16.7% female) from 110 countries, including 12 Nobel laureates, and provides research grants, awards and medals, fellowship support, research exchanges, and training. The number of Chinese fellows was the largest at 264, followed by India (241) and Brazil (150) (94 Americans and 4 Japanese).

The current President of TWAS is Mohamed H.A. Hassan (incidentally, the previous President of TWAS was the current President of CAS, Bai Chunli). Currently, 21 organizations in Asia, 13 organizations in Africa, 9 organizations in Latin America, and 50 organizations in Europe and other regions are TWAS partners (JST participates from Japan).[124]

TWAS's total revenue for 2020-2021 was 8.78 million USD, with the majority coming from Italy (3.83 million USD) and Sweden (3.08 million USD).[125] The third largest contributor was Lenovo[126] (228,000 USD) (Lenovo's contribution is earmarked for an award named after the company). In addition to this regular income, TWAS has set up an endowment fund (total of 14.13 million USD) with donations from various organizations from 1994 to 2021, and these funds have been used for the secretariat's operations. Taiwan has also contributed, with Academia Sinica contributing 100,000 USD. On the other hand, for the endowment fund (total of 192,479 USD) from individual donors during the same period, 32 (20%) of the total 158 donors were Chinese. Additionally, in 2021, 6 (24%) of the 25 individual donors to TWAS were Chinese.[127] In 1991, UNESCO assumed responsibility for managing TWAS funds and staff (equivalent to Category 1 in UNESCO's classification) under an agreement signed by TWAS and UNESCO.

In May 2013, the CAS announced the establishment of the CAS-TWAS Centres of Excellence in five areas: climate, water, space technology for disaster mitigation, green technology, and biotechnology.[128] In 2018, the Centre of Excellence for Emerging Infectious Disease was added, bring the total to six fields (see Table 2). These centers provide

123 Refer to: https://twas.org/directory/overview

124 https://twas.org/twas-voice-science-south, CAS President Bai Chunli was elected as TWAS President in September 2012. In Chinese documents, TWAS is sometimes translated as "Developing Countries Academy of Sciences."

125 Annual Report 2021, The World Academy of Sciences, https://twas.org/sites/default/files/twas_ar_21_imp_web_red.pdf
On page 48 of the Annual Report 2021, China appears 63 times (Taiwan appears 12 times) and Japan appears 2 times (only JST and Japan).

126 Lenovo Corporation

127 TWAS 2021 Annual Report, Financial Report, https://twas.org/sites/default/files/twas_ar_21_imp_web_red.pdf

128 Refer to: https://twas.org/article/cas-twas-open-ambitious-centres-excellence From 2013 the CAS began to strengthen its cooperation with developing countries.

training opportunities for scientists and engineers from developing countries with the aim of promoting research in their respective fields, exchanging knowledge and building global networks. When the centers were founded, CAS provided 6.5 million USD over three years for the five center's program operations (workshops, training, doctoral programs, collaborative start-up projects, and other staff costs). Additionally, through these contributions and in accordance with an agreement signed in February 2013, 140 young researchers from developing countries are invited to China every year for doctoral research. The research institutes listed in parenthesis next to each center's name in the following table are research institutes affiliated with CAS and are the hosts for that center.

TWAS has its own training program for doctoral students, and a total of 1,013 students received training in 2021, and of the 103 students who completed their training that year, 35 (34%) had received training in China.[129]

Table 2: CAS-TWAS Centres of Excellence

Center Name	Achievements
CAS-TWAS Centre of Excellence for Biotechnology	・Construction of a bioinformation platform centered around "Internet + biotechnology" ・China-Indonesia Julong Agricultural Industry Cooperation Zone
CAS-TWAS Centre of Excellence for Water and Environment	・Construction of a platform for "human resources development / science and technology support / corporate participation" ・MOU between the CAS Research Center for Ecology and Environment of Central Asia and the University of Tehran
CAS-TWAS Centre of Excellence for Green Technology	・54 international students from developing countries obtain master's and doctoral degrees ・1,500 scholars participated in a Belt and Road green technology subcommittee, of which approx. 300 were from developing countries
CAS-TWAS Centre of Excellence for Space Technology for Disaster Mitigation	・Currently conducting joint research with Mongolia, Thailand, and Indonesia, etc. ・Currently training doctoral students from developing countries via support from the CAS-TWAS President's Fellowship Programme and the Space Technology for Disaster Mitigation Fund ・Currently, 14 of the 20 international students from developing countries are studying on scholarships
CAS-TWAS Centre of Excellence for Climate and Environment Sciences	・Held a total of fifteen CAS-TWAS-WMO Forums, building networks with Thailand, Sri Lanka, Iran, Pakistan, and Mongolia, etc. ・Fostering 400 individuals from developing countries by constructing an international education and training platform
CAS-TWAS Centre of Excellence for Emerging Infectious Disease (Institut Pasteur of Shanghai and Wuhan Institute of Virology among others)	・Was newly established in 2018, and so far has had no noticeable movements

Source: Created by the authors from TWAS materials

(2) Belt and Road Science and Technology Cooperation Action Plan[130]

The CAS action plan was formulated in early 2016, and lays out the following goals, "In the process of jointly building the Belt and Road and while realizing the Five Links (policy communication, facility connectivity, unimpeded trade, financial integration, and people-to-people ties), with science and technology as the guiding principle, aim to

[129] TWAS 2021 Annual Report, p. 19, https://twas.org/sites/default/files/twas_ar_21_imp_web_red.pdf

[130] Refer to:http://www.scio.gov.cn/xwfbh/xwbfbh/wqfbh/37601/38866/xgzc38872/document/1636160/1636160.htm
The translation for this Chinese document was done via machine translation.

improve quality and efficiency, establish a positive image for the CAS, advocate cutting-edge science and technology, emphasize cooperation in production capabilities, emphasize both justice and profit, and adhere to joint development, ultimately effectively realizing China's overseas investments." Specifically, it proposes "Through science and technology cooperation and training for science personnel, cultivate a group of young backbone personnel and high-level personnel who 'know China and love China' in the intellectual and scientific circles of the relevant countries (regions)." It further states that, "in collaboration with partner organizations in countries (regions) along the Belt and Road, implement international science and technology research plans that explore development strategies for all involved; jointly build international science and technology cooperation platforms; develop science, technology, and innovation personnel; and promote the construction of 'connections between major countries and regions along the Belt and Road, two-way opening and sharing of scientific research resources, and two-way exchange of innovative talents.'"

CAS has is building a cooperative research network with more than 40 institutions in 14 countries around a "Third-Pole" and is conducting comprehensive earth science surveys of glaciers, rivers, lakes, and other areas, has also carried out more than 100 science and technology cooperation projects, and supports the construction of a "Green Silk Road." At the beginning of 2018, a special project for "Pan-Third Pole Environment Study for a Green Silk Road" was established.[131]

The specific strategic goals are as follows:

(a) Establish an international alliance and think tank network based on academies of sciences and scientific research institutes; develop scientific alliances and data platforms based on specialized fields recommended by the national academies of countries along the Belt and Road; provide strategic science and technology consulting advice to the Chinese government and countries along the Belt and Road; (when the time is ripe) establish an international organization for the Belt and Road initiative centered on the national academies of science and major scientific research institutes along the Belt and Road and then select an executive director from China and a chairperson from around the world.

(b) Establish Belt and Road international joint research programs; address major common scientific and technological needs and challenges for key countries (regions) along the Belt and Road; implement scientific and technical cooperation with corresponding organizations in countries (regions) and with relevant international organizations; jointly construct innovation cooperation centers; explore and implement strategic cooperation that integrates "scientific research, technological innovation, human resource development, and achievements" with cooperation platforms and networks as the fulcrum.

(c) Implement scientific and technical cooperation based on China's relevant superior production capabilities to meet the needs of countries (regions) along the Belt and Road; strengthen industry by establishing an image of China's applied technologies and high-quality production capacity; actively participate in the development of industrial standards in countries along the Belt and Road; transform China's high-quality production capacity exports and achievements in science and technology; by 2020, deploy numerous overseas research and development centers along the Belt and Road to globalize enterprises' high-quality production capacity and

131 Refer to: https://spc.jst.go.jp/news/190404/topic_1_05.html

applicable technologies.

(d) Each year, train 400 master's and doctoral candidates from countries along the Belt and Road in the University of Chinese Academy of Sciences, research institutes, and overseas scientific educational institutions; train 800 scientific research and management specialists; for a medium-term goal by 2030, form a Belt and Road science and technology cooperation network system by 2030 and achieve the role of a "backbone network" that promotes bilateral, multilateral, and regional science and technology cooperation.

The core areas of this policy are biomedicine, disease and health, biotechnology, water treatment technology, green energy technology, disaster prevention, climate change, water resources, and environmental and ecological protection. The projects under its umbrella are as follows.

Table 3: Main Belt and Road-related international cooperation projects

Project Name	Examples of projects promoted	Chief researcher / individual in charge
Federation of scientists	Conducted more than 10 scientific and technological explorations in Central Asia, Russia, and Mongolia, etc.	Sun Jiulin (academician, Chinese Academy of Engineering)
Natural disaster risk research plan	Establishment of the China-Pakistan Joint Research Center on Earth Sciences	Peng Cui (CAS academician)
Climate change research	Collecting and analyzing weather data from more than ten base stations in Sri Lanka, Thailand, and five Central Asian countries	Zhu Jiang (Director-General of the CAS Institute of Atmospheric Physics)
Clean water technology	Establishment of the China-Sri Lanka Joint Research and Demonstration Center for Water Technology	Min Yang (Deputy Director of CAS Research Center for Eco-Environmental Sciences)
Support for new infectious diseases	IPS established joint research centers with Iran, Cambodia, and Senegal	Fu Gao (CAS academician)
Biotechnology research	Promoted joint bio-research with Nepal, Taipei, and Pakistan, etc.	Li Ying (Deputy Director-General of CAS Tianjin Institute of Industrial Biotechnology)
Low cost health solutions	Joint health and medical technology plan with Thailand	Wang Lei (Deputy-Director of CAS Institute of Biomedical Engineering)

Source: Created by the authors from relevant materials

According to this policy, in CAS relations, China has established the Sino-Africa Joint Research Center, the Central Asian Center of Drug Discovery and Development, the Research Center for Ecology and Environment of Central Asia, the South America Center for Astronomy, the China-Brazil Joint Laboratory for Space Weather, the China–Sri Lanka Joint Center for Education and Research, the Kathmandu Center for Research and Education, the Southeast Asia Biodiversity Research Institute, and the Innovation Cooperation Center.

In terms of the amount of financial investment for this policy, as of April 2019, CAS President Bai Chunli has said

that more than 1.8 billion RMB has been invested.[132]

Furthermore, President Xi Jinping attended the 29th APEC Economic Leaders' Meeting, and announced in his speech at the informal summit that the Third Belt and Road Forum for International Cooperation would be held in 2023.

(3) Science and technology exchanges and talent exchanges amongst Belt and Road countries

As for the results of the aforementioned goal of "Each year, train 400 master's and doctoral candidates from countries along the Belt and Road in the University of Chinese Academy of Sciences, research institutes, and overseas scientific educational institutions; train 800 scientific research and management specialists," according to early statistics, the CAS has so far trained nearly 5,000 high-level science and technology personnel (including more than 1,500 master's and doctoral students in science and engineering) for the relevant countries (regions). Many of them have already completed their studies and have since returned to their own countries, becoming new forces in the Belt and Road joint construction effort. For example, under the CAS President's International Fellowship Initiative (PIFI),[133] outstanding science and technology elites from countries along the Belt and Road are brought to China to conduct postdoctoral research or short-term visiting research. The Developing Countries Training School has funded nearly 1,000 scientific researchers and science and technology officials from countries along the Belt and Road who have received technical training in China.[134]

In terms of personnel exchanges related to the Belt and Road, the Chinese government has invested approx. 1.8 billion RMB (approx. 31 billion JPY) in Belt and Road projects from 2013 to 2019 in Belt and Road science and technology projects, and has promoted exchanges with over 120,000 foreign scientists in the twelve priority areas of: agriculture, energy, transportation, information and communications, resources, environment, oceans, advanced manufacturing, new materials, aviation and space, medicine, and disaster prevention. Furthermore, the role of ANSO as mentioned above has been critical in supporting Belt and Road promotion, and cooperation from academic institutions such as the Russian Academy of Sciences, the Chilean Academy of Sciences, and UNESCO has also been valuable. Five specialized research centers have also been established in China, and each year approx. 200 researchers (doctoral level) are invited to conduct academic research.

Belt and Road human resources development is often linked to UNESCO activities. For example, the CAS and UNESCO have entered into a partnership to jointly develop personnel to preserve heritage sites by utilizing space technologies and provide them to countries along the Belt and Road, and the CAS Institute of Remote Sensing and Digital Earth and UNESCO are also implementing programs to provides technologies related to satellite image usage to Belt and Road-related countries.[135]

[132] Refer to: https://www.cas.cn/cm/201904/t20190422_4689428.shtml?from=timeline

[133] Refer to: http://english.aircas.cn/education/PIFI/

[134] "China's Science and Technology Supports Construction of the Belt and Road," People's Next Japanese version, April 22, 2019, 14:37. Refer to: http://j.people.com.cn/n3/2019/0422/c95952-9570545.html

[135] Kristine Lee and Alexander Sullivan, Center for a New American Security (CNAS), "People's Republic of the United Nations", ASIA-PACIFIC SECURITY | MAY 2019, https://s3.us-east-1.amazonaws.com/files.cnas.org/backgrounds/documents/CNAS-Report-China-IO-final-web-b.pdf?mtime=20190513092354&focal=none

In May 2023, China hosted the China-Central Asia Summit in conjunction with the G7 Hiroshima Summit. In his keynote speech, President Xi Jinping laid out international cooperation initiatives centered around the Belt and Road in agriculture, medicine, and the environment, and specifically stated that China is advocating for the construction of high-tech factories in Central Asia, for the expansion of technical skills development schemes, and for recruitment to the University Alliance of the Silk Road.[136]

(4) CAS overseas science education centers (bases)[137]

At the 18th National Congress (November 2012), after the CPC Central Committee proposed the idea of "planning science, technology, and innovation from a global perspective," the CAS launched the Expanding Science and Education Cooperation with Developing Countries Project in 2013, and has begun full-scale multifaceted international science education activities, including cooperation with TWAS, UNESCO, and others. By 2020, the CAS had decided to establish "overseas science education centers (bases)" in developing countries and in countries with unique geographical conditions and advantageous research resources. The overall goal is to establish and steadily operate approx. ten overseas science education bases that integrate scientific research, education, and training in developing countries and regions that are blessed with geographical conditions and scientific research resources. Based on this idea, since 2013 the CAS has been building a Belt and Road science and technology cooperation system that integrates "human resources, platforms, and projects."

Based on the principle of "joint consultation, joint construction, and sharing," ten "overseas science education centers" are reported to have been established in regions such as Africa, South America, Central Asia, South Asia, and Southeast Asia. These centers will be an important means for China to expand its international influence and participate in global governance, and will be "new landmarks" for realizing the Belt and Road Initiative. The centers play the role of a platform for international cooperation, attracting large-scale scientific research projects, and contributing to improving civil society issues and scientific and technological innovation capacity.

The nine centers, including the Central Asian Center of Drug Discovery and Development, that have been established under the aforementioned "Belt and Road Science and Technology Cooperation Action Plan" are also responsible for educational activities. As of June 2016, these nine overseas science education centers have published a total of 108 papers, 12 books, and 17 patents.

(5) International science support programs

This section will introduce international frameworks to support scientific programs led by China.

136 President Xi Jinping Chairs the Inaugural China-Central Asia Summit and Delivers a Keynote Speech 2023-05-19 17:24. Refer to: https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/202305/t20230519_11080116.html

137 file:///C:/Users/takayuki.shirao.kf/Desktop/%E3%82%A2%E3%82%B8%E3%82%A2%E5%A4%AA%E5%B9%B3%E6%B4%8B%E3%82%BB%E3%83%B3%E3%82%BF%E3%83%BC/%E8%AA%BF%E6%9F%BB%E7%A0%94%E7%A9%B6%E4%BB%A4%E5%92%8C4%E5%B9%B4%E5%BA%A6/%E4%B8%AD%E5%9B%BD%E7%A7%91%E5%AD%A6%E6%8A%80%E8%A1%93%E3%82%A4%E3%83%B3%E3%83%95%E3%83%A9/%E4%B8%AD%E5%9B%BD%E7%A7%91%E5%AD%A6%E9%99%A2%E6%B5%B7%E5%A4%96%E7%A7%91%E6%95%99%E5%9F%BA%E5%9C%B0%E7%AE%80%E4%BB%8B_NormalPdf%20(1).pdf

1. Sustainable Development International Cooperation Program

The Sustainable Development International Cooperation Program is an international agricultural collaborative research program established by the NSFC and the Bill & Melinda Gates Foundation.

The first research field being supported is crop breeding strategies for climate change and extreme weather events. In response to the United nations Sustainable Development Goals and as crop genetic resources and genetic improvements are facing new challenges against the backdrop of climate change, the program is researching crop breeding strategies, such as increasing improvements to stress tolerance traits in staple food crops, and increasing the selection and breeding of climate-responsive varieties such as oilseeds and vegetables.

The second area of research being supported is related to the research and implementation of comprehensive agricultural weather index insurance. Agricultural weather index insurance (index-based weather insurance), which is still in its infancy around the world, is more suitable for small-scale agricultural economies, such as those found in China and Africa, when compared to actual production loss insurance for large-scale farms in the West. Because it can serve as cross-industry insurance for various regions, this research will be combined with collaborative efforts in comprehensive finance, actuarial science, weather forecasting, and major output factor analysis for agriculture (crops, livestock, and aquatic products, etc.).

Joint support is being provided, with up to 1.5 million RMB from the NSFC and up to 250,000 USD from the Bill & Melinda Gates Foundation.

2. Cooperation programs at the Forum on China-Africa Cooperation[138]

The Forum on China-Africa Cooperation (FOCAC),[139] a framework for regional cooperation between China and Africa that began in 2000, consistently identifies infrastructure, trade/investment, agriculture, medical care/health, human resource development/education, and people-to-people/cultural exchanges as priority areas.[140] Under the nine priority programs outlined at the 8th FOCAC (November 21), the Chinese government will closely work with African countries on implementing:

(a) Medical/health programs
(b) Poverty reduction and agricultural development programs
(c) Trade promotion programs
(d) Investment promotion programs
(e) Digital innovation programs
(f) Green development programs
(g) Capacity development programs
(h) Cultural and people-to-people exchange programs

[138] Report on International Research Projects for Building an Integrated Economic Growth Strategy in FY2021 (Research on Human Resources Development in the Chinese, German, and South Korean manufacturing industries), Mitsubishi UFJ Research & Consulting, March 2020, https://www.meti.go.jp/meti_lib/report/2021FY/000259.pdf

[139] Refer to: http://www.focac.org/eng/

[140] FOCAC can be said to be an activity similar in purpose to TICAD, that is, a framework conference for cooperation with Africa that Japan started in 2007. Refer to: https://www.mofa.go.jp/mofaj/area/ticad/index.html

(k) Peace and security programs

The priority areas in the China-Africa Cooperation Vision 2035 presented at the 8th FOCAC are agriculture, manufacturing, infrastructure, environmental protection, digital economy, and blue economy. Support for improving the business environment in Africa will be strengthened, and the localization of Chinese companies in Africa will be further promoted. Similarly, the priority areas of the China-Africa Cooperation Vision 2035 are strengthening the industrial chain in the agricultural sector, integrating manufacturing sectors into global supply chains, expanding domestic industrial and technical standards, and digital innovation.

(6) International scientific research programs led by China

Next, international scientific research programs in which Chinese scientists propose research themes and the international scientific community responds to them will be introduced.

1. Deep-time Digital Earth (DDE)[141]

Deep-time Digital Earth (DDE) was proposed by Chinese scientists, brought forward in February 2019 at a meeting of the Executive Committee of the International Union of Geological Sciences (IUGS) as the IUGS's first large-scale international science and technology cooperation project, and then an agreement was subsequently signed to official launch it. Eighteen countries and international organizations are participating as founding members, including institutions from the United Kingdom, Russia, and the United States.[142] The project will construct an international platform for global cooperation and exchanges between geoscientists and data scientists, and the goal is to recreate the complete history of life's evolution by using highly efficient supercomputing methods and global geological big data that has been accumulated over millions of years in geology.

In November 2022, an open forum was jointly held by UNESCO, the International Year of Basic Sciences for Sustainable Development (IYBSSD2022), IUGS, and DDE.

China will establish a DDE secretariat in Suzhou and provide financial support for the establishment of a DDE Research Centre of Excellence. DDE/RCE are also scheduled to be established in the United Kingdom and the United States.

2. Global-Ocean Negative Carbon Emissions[143]

Carbon neutrality is seen as a strong starting point for putting into practice the concept of community for humanity to create a common future. This international project was also proposed and launched by Chinese scientists and is an ocean program aiming for global carbon neutrality.

[141] Refer to: https://www.iugs.org/dde
Although a financial background cannot be found on the site, scientists have also expressed the view that China is providing a large amount of funding, but is paying close attention to matters such as how the data is handled. (https://www.jstage.jst.go.jp/article/tits/26/8/26_8_26/_pdf/-char/ja)

[142] Refer to: https://dde-world.oss-cn-hongkong.aliyuncs.com/file/2022/10/24/a8b703cda5894d2faa9e56b7724f325f.pdf

[143] Refer to: https://www.global-once.org/#/home

Global-Ocean Negative Carbon Emissions (Global-ONCE Project) is led by Xiamen University,[144] and, in June 2022, was approved by the United Nations as part of the "United Nations Ocean Decade" international big science program. The system is primarily managed by the United Nations Ocean Decade Alliance.

The Global-ONCE Project derives from a theoretical framework for microbial carbon pumps (MCP), a new mechanism for ocean carbon storage that was proposed by Chinese scientists in 2010, thereby ushering in the new field of microbial oceanography and a new paradigm for negative ocean emissions. The project has concluded agreements with scientists and international organizations from 36 countries, covers more than 20 major national cooperation units, and has received multiple rounds of support from local governments, international companies, and investment institutions. The Global-ONE Project also extensively collaborates with international organizations such as the International Council for the Exploration of the Sea (ICES), the North Pacific Marine Science Organization (PICES), and the Integrated Marine Biosphere Research (IMBeR) project.

The Global-ONE Project will construct carbon sink monitoring stations; develop and evaluate negative ocean emissions methods, standards, and engineering in structure; provide the scientific basis for governments to make relevant decisions; promote interdisciplinary research on key ocean carbon sink processes; provide a communications platform for scientists, decision makers, industry, and the general public; and provide data, knowledge, technology, and practical experience on negative ocean emissions to help human society cope with global climate change.

(7) Establishment of science and technology funds

1. Belt and Road science and technology achievements transfer and transformation fund

In order to strengthen application of science and technology achievements in Belt and Road countries, the CAS established a Belt and Road science and technology achievements transfer and transformation fund to support more than 100 science and technology enterprises and research institutes, the Belt and Road Industry Alliance, and the Innovation Cooperation Center mentioned above. These measures provide a model for the application of scientific and technological achievements in countries along the Belt and Road, promote transfer and transformation, contribute to regional and sub-regional economic and social development, and produce positive effects.[145]

As previously mentioned, CAS President Bai Chunli has been investing funds in human resource development and personnel exchanges within the overall framework of the Belt and Road Initiative, and this fund provides the financial resources to support these activities.

As previously mentioned, CAS President Bai Chunli has been investing funds in human resource development and personnel exchanges within the overall framework of the Belt and Road Initiative, and this fund provides the financial resources to support these activities. As noted when discussing international projects, the CAS established the CAS-TWAS President's Fellowship Programme in 2014 and the Belt and Road Master's Graduate Scholarship Program in 2017, and they provide financial support to outstanding students from developing countries and Belt and Road

[144] Refer to: https://oceandecade.org/actions/global-ocean-negative-carbon-emission/

[145] This text is quoted from Science and Technology news by JST Science Portal China. https://spc.jst.go.jp/news/190404/topic_1_05.html

countries to obtain degrees in China. To date, financial support has been provided to more than 1,000 outstanding students.

2. "Establishment of a global scientific research fund to deepen international joint research"

In order to establish this fund, the NSFC, based on Chapter 9 of the 14th Five-Year Plan (2021-2025) for National Economic and Social Development and Vision 2035 stipulates the "Establishment of a global scientific research fund to deepen international collaborative research."[146] An outline is as follows.

China will establish a world-class scientific research fund to adhere to the idea of expanding openness to the outside world, actively integrate into global innovation networks, aim at the world's scientific frontiers and common global challenges, and strengthen support for outstanding foreign talent to come to China to conduct joint research and exchanges.

China will comprehensively and systemically deepen international (regional) cooperation; carry out strategic dialogue and policy discussions with foreign science funding agencies and international organizations; organize a wide range of bilateral/multilateral cooperation and exchange activities; and strengthen science, technology, and innovation cooperation in common fields. New funding mechanisms and new ways to help Chinese scientists leverage large-scale scientific facilities for to support carrying out international collaborative research and exchanges will be explored; domestic scholars will also be encouraged to take the lead in organizing or deeply participating in international scientific programs.

(a) International (regional) cooperation and exchange projects

International (regional) cooperation and exchange projects, under the framework of bilateral (multilateral) agreements concluded with foreign scientific funding agencies (or with research institutes and international scientific organizations), will provide funds for personnel exchanges conducted by the NSFC; and exchange activities, such as participation in multiple bilateral (multilateral) meetings held abroad, are aimed at building opportunities for cooperation, deepening cooperation, and laying the foundation for promoting substantive cooperation.

(b) International (regional) joint research projects

International (regional) joint research projects support science and technology personnel standing at the forefront of science; support the effective utilization of international science and technology resources; and support conducting substantial international (regional) joint research based on the principle of equal cooperation. Based on the premise of mutual benefits and the sharing of results, international (regional) joint research projects are divided into priority international (regional) joint research projects and inter-institutional (regional) joint research projects.

In the science fund's preferential funding areas, priority international (regional) joint research projects will support large-scale international scientific research projects or programs involving Chinese scientists, as well as science and technology personnel focused on international (regional) cooperation with overseas partners. Inter-institutional

[146] https://www.nsfc.gov.cn/publish/portal0/tab1392/info87783.htm

(regional) joint research projects as research at large-scale international scientific facilities will be bilateral (multilateral) joint research projects that are jointly organized by the NSFC and foreign science funding agencies (or research institutions and international science organizations) to provide funding for science and technology personnel.

(c) Research grant projects for foreign researchers

Research grant projects for foreign researchers are projects that allow foreign researchers to come to China to conduct research activities; independently select a topic within the scope of the funding provided by the NSFC; carry out basic research activities in mainland China; promote long-term cooperation and stable academic exchanges between foreign and Chinese researchers; and support outstanding foreign researchers who promote research over the long term.

In accordance with the above policy, the NSFC operates priority international joint research projects and inter-institutional international cooperation projects as international cooperation and exchange projects and international research programs; and operates the Foreign Outstanding Young Scholars Research Fund and the Foreign High-Level Scholars Research Fund as research funding projects for foreign researchers.

(8) Domestic institutions supporting international projects

It is believed that a number of various Chinese domestic institutions are involved in carrying out the above international projects. An FY2022 study commissioned by the ARPC, "Study on Analysis of the Structure and Functions of China's Science and Technology Intermediary Agent," has partially brought to light the current situation, and as such a few selected examples from it will be introduced.

1. Incubators

To begin with, incubators are a form of an intermediary organizations, and China has been active in this area, such as the "Beihang Incubator" that is supported by the Zhongguancun Science Park and participates in Beijing Belt and Road International Co-incubation (ICI) (). ICI aims to share innovation and entrepreneurship resources between Beijing and Belt and Road countries, and to explore new cross-border models of joint incubation for mutual benefits and win-win results. Through the Beihang Incubator, ICI has successfully introduced outstanding incubation projects from Israel and the United States that are involved in numerous strategic emerging industries such as ICT, intelligent hardware, robotics, high-end equipment, and digital technologies.

The international cooperation of another incubator, Tianjin Zhihuigu Technology Service Co., Ltd. (天津智汇谷科技服务有限公司、天津智匯), is primarily carried out through the open platform international website iFLYTEK.[147] It already covers regions such as Singapore, Japan, Thailand, the Philippines, Vietnam, and Malaysia, and provides advanced AI technology, capabilities, and one-stop solutions to realize AI globalization strategies, primarily for domestic and overseas companies, governmental agencies, and developers expanding overseas. The provided technologies include core technologies such as speech synthesis/recognition and machine translation, as well as

147 Refer to: https://global.iflytek.com/

services such as smart education, smart medicine, corporate digitalization, smart cities, and AI marketting. Tianjin Zhihuigu has the character of an iFLYTEK technical support branch for medicine and corporate digitalization, and is actively expanding in these fields.

Since 2020, Tianjin Zhihuigu has been actively promoting cooperation with Belt and Road countries in line with its development strategy. As the implementing entity, the company signed a MOU with iFLYTEK and the Malaysian Digital Economy Cooperation in November 2020 to jointly establish an AI innovation center at an appropriate opportunity in the future. The Malaysia Digital Economy Corporation will provide policy support for the establishment of the AI innovation center until 2024, and the Malaysian government, iFLYTEK, and Tianjin Zhihuigu will regularly promote visits, exchanges, and cooperation on research and other topics. At the same time, the Malaysia Digital Economy Corporation, an ASEAN member state, plans to actively encourage the development of Tianjin Zhihuigu's AI projects in ASEAN countries.

2. Productivity promotion centers

Productivity promotion centers are typically intermediary organizations that have the function of converting scientific and technological achievements into industry, and China is actively expanding its innovation cooperation activities in Belt and Road countries. It is playing a leading role in constructing the Belt and Road by engaging in high-level, multifaceted, and wide-ranging innovation dialogue with governmental departments, research institutes, prominent universities, and companies in the Belt and Road.

Specifically, the Jiangsu Belt and Road Technology Transfer & Collaborative Innovation Alliance, which was primarily established by the Jiangsu Productivity Promotion Center, has built close cooperative relationships with 28 Belt and Road countries and regions, and has implemented more than 50 scientific and technological cooperation projects and established more than 30 innovation carriers, including joint laboratories and overseas incubators. Going forward, the Alliance will make further efforts to bring the innovation cooperation results of Belt and Road countries to fruition, expand the Belt and Road innovation cooperation friendship zone, establish specialized science and technology service teams, and build its service brand through international production capacity cooperation led by science, technology, and innovation.

The Beijing High Technology Achievement Transformation Service Platform (北京高科启创科技成果转化服务平台), which has the same functions as the aforementioned productivity promotion centers, cooperates with the National Eastern Tech-Transfer Center and has signed an agreement with Germany's Steinbeis.[148] In addition to cooperating on an international technology transfer platform and human resources development bases, China intends to widely utilize Steinbeis' global innovation network and resources to develop cooperation on innovation and entrepreneurship projects. China has also conducted strategic-level cooperation with research-oriented foreign companies such as ABB

[148] The German Steinbeis Foundation was established in 1971, and its headquarters are in Stuttgart, Baden-Württemberg. Steinbeis is the largest industry-academia cooperative in Europe that provides paid consulting and development services to individual companies in the areas of management, technology, and knowledge, with the aim of increasing companies' competitiveness and promoting industrial revitalization. Steinbeis has established 400 "STC" knowledge transfer centers around the world, and has more than 3,600 specialist staff that work on commissioned projects. Steinbeis Japan was established in Tokyo in 1999 as a headquarters for the Japanese market, with the aim of providing Japanese customers with speedy, high-quality problem solving by making full use of the global Steinbeis network. Refer to: http://www.steinbeis.co.jp/jp/

Beijing Drive Systems Co, Ltd., Intel China Research Centre Ltd., Hitachi (China) Ltd., and MSD China.

The National Technology Transfer Center of Xi'an Jiaotong University (西安交通大学国家技术转移中心) has the same intermediary functions and handles international cooperation work. The center's primary task is to explore introducing overseas technology transfer operating models and successful experiences. Specifically, its goal is to promote the dissemination of international achievements, technology transfer, and capital management, as well as to promote the domestic introduction, local incubation, and transfer and transformation of scientific and technological achievements. The idea is that the center will jointly establish research institutes and technology research centers across companies internationally, as well as providing policy consulting and bridging services for corporate cooperation. Other activities include exhibiting technological innovations, holding events both domestically and internationally, and internationally providing comprehensive services such as technology, human resources, information, law, management, and training. In December 2019, the center, the China-Arab States Technology Transfer Center, and the China-ASEAN Technology Transfer Center jointly signed the Belt and Road Technology Transfer Services Alliance Initiative. The alliance will work to establish an efficient cooperation and coordination mechanism, and to promote the free flow of innovation elements such as projects, human resources, and capital with Belt and Road countries and regions. Additionally, the center collaborates with more than thirteen universities, research institutes, and scientific innovation companies in six countries, including the United States, Germany, the United Kingdom, France, Japan, and Italy, and it builds cooperative strategic relationships via the industrialization of scientific and technology achievements at the government, industry, academia, and research levels. The center is one of the 18 initial member organizations in the China-ASEAN Technology Transfer Federation established in 2022, has already concluded memorandums of cooperation with the ministries of science and technology in Vietnam and Indonesia, and in the future plans to cooperate at the project level in the transfer of technological results and science and technology cooperation.

3. Technology and property exchange organizations

There are also intermediary organizations called technology property exchange organizations, which function to promote the practical application of research and development results surrounding intellectual property rights such as patents.

Amongst them, China Technology Exchange (中国技术交易所有限公司、中技所) is aiming to strengthen international science and technology exchanges and cooperation and to promote cross-border technology and industrial transfers, and in order to do so has established a wide range of business cooperation channels with more than 400 international technology transfer organizations, including the World Intellectual Property Organization (WIPO), the Sino-Scandinavian Innovation & Entrepreneurship Centre (SSEIC), the China- Finland ICT Alliance, Israel's Trendlines incubator group, and Japan's JST. They have also built a shared database containing information on more than two million companies around the world, stock a large amount of high-quality international technology transfer project resources, and conduct matching and exchange activities with science and technology parks across China.

Similarly, Shenzhen United Property and Equity Exchange (深圳联合产权交易所股份有限公司、連交所) is also a technology property trading organization, and on October 9, 2012, it signed an agreement in Chicago with the American company Ocean Tomo regarding the establishment of the China-US technology transfer center and the

joint research and development of a China-US intellectual property index, and officially announced the establishment of a China-US technology transfer center. The China-US technology transfer center is supposed to establish a global trading network for technology and capital, fully absorb advanced ideas and successful experiences from abroad, and actively develop outstanding professional institutions to Shenzhen to develop innovative services. It will also construct an international technology transfer platform based on the concept of "science & technology + finance + services"; build an advanced high-end service center for element collection, flow, and distribution; and realize an innovative technology transfer model that combines technology and capital. The China-US technology transfer center plans to adopt platform methods, and its primary business activities will include technology transactions, technology and capital matching services, intellectual property rights consulting and advisory services, and investment services for companies rich in intellectual property rights. Currently, the center is utilizing sharing video presentations to promote the transfer of technology assets for four Stanford University projects, including 3D cell proliferation, drug addiction treatment, activated carbon molecules, and minicircle DNA. The center's main significance is, first and foremost, to provide a platform to bridge domestic and international high-tech property rights transactions. As is well known, there are many high-tech enterprises in Shenzhen, and in the development processes of these high-tech enterprises there is demand for high-tech relocation, and the China-US technology transfer center can meet the high-tech transfer needs of these enterprises.[149]

4. Science and technology financial institutions

Science and technology financial institutions are organizations that play an intermediary role on the financial side. In particular, the China Science and Technology Finance Promotion Association (中国科技金融促进会) started its international cooperation relatively late, and, centered around the International Cooperation Department of the Ministry of Science and Technology's Torch High Technology Industry Development Center, it carries out international development work with the China Association for International Science and Technology Cooperation, the China International Association for Promotion of Science and Technology, and others. There is regular communication and coordination with these partners in terms of resources such as experts and projects. Via the China International Association for Science and Technology Cooperation, the China Science and Technology Finance Promotion Association has obtained a significant amount of cooperation information on related technology projects in Japan, primarily in the areas of medical care, low carbon and environmental protection, and elderly care. For its member companies, the finance promotion association discloses projects related to carbon neutrality in the field of environmental conservation (such as the Kobe Medical Industry Development Project and Ituba Kyoso Co., Ltd.), as well as projects related to experience and technology in the field of elder care. It has engaged in communications about the projects and considerations about them as businesses, including with the Ping An Group, the Industrial and Commercial Bank of China, some local high-tech park management committees, and science and technology companies. In the next step, the association plans to coordinate related needs and negotiate cooperation with the above partners.

[149] In preparing this report, the authors have not conducted an analysis that reflects the regulatory situation regarding high-end technology transactions and technology transfers between the United States and China. As such, although some technology transfer transactions and related organizations are described, please refer to expert analysis for the latest developments.

Although the Inner Mongolia Science and Technology Finance Comprehensive Services Platform (内蒙古科技融资综合服务平台) currently does not have many international cooperation projects, there is a "science and technology innovation methods popularization and application base" that was jointly build by Heibei University of Technology's National Engineering Research Center for Technological Innovation Methods and Tools and by Peter the Great St. Petersburg Polytechnic University in Russia. The base is an international academic exchange base for industry, academia, and research collaboration, with the aim of accelerating the transformation of scientific and technological achievements and the industrialization of high-tech achievements through the fusion of knowledge innovation and technological innovation.

5. Science and technology evaluation institutions

The Henan Province China Innovation Science and Technology Evaluation Research Institute (河南省中创科技评价研究院、中創研究院), which plays an intermediary role as a science and technology evaluation institution, actively participates in key special projects from the Ministry of Science and Technology and the Henan Provincial Science and Technology Agency, such as on intergovernmental international science and technology innovation cooperation and on international joint laboratories, in order to link with international science, technology, and innovation resources and fully play the leading and demonstrative role of an international science and technology cooperation platform. Currently, in the field of science and technology performance evaluations, the institute has built strategic cooperative relationships with more than 10 overseas research institutions, including the Volcani Institute of the Israeli Ministry of Agriculture and Rural Development, the Slovenian JT Business Development innovation and cooperation platform, and the International Technology Transfer Network (ITTN). Going forward, it plans to carry out specific cooperation in the evaluation and application of scientific and technological achievements in specific projects.

6. Patent agent institutions

There are also patent agent intermediary institutions. Among them, the CCPIT Patent and Trademark Law Office (中国国际贸易促进委员会专利商标事务所) has organized a series of large-scale international intellectual property rights forums, seminars, and overseas study tours to promote international exchanges on intellectual property rights in China. In 1973, China entered into an alliance with the WTO, and subsequently joined the International Association for the Protection of Intellectual Property (AIPPI) and the Licensing Executives Society International (LES), and established the AIPPI China Branch and LES China Branch in China, and the CCPIT Patent and Trademark Law Office has played a very important role in this. It has also been commissioned by the Japan External Trade Organization (JETRO) to collaborate with China's customs, industry, and commerce departments; to hold seminars on measures against counterfeit products and rights protection, as well as seminars on intellectual property rights protection; and plays an important role in promoting exchanges between Japan and China in the field of intellectual property rights, such as strengthening exchanges and cooperation between Japanese companies and China's anti-counterfeiting enforcement agency.

Jinan Shengda Intellectual Property Agency Co., Ltd. (济南圣达知识产权代理有限公司、済南産権) has long-term and stable business partnerships with famous firms in the United States, EU, Japan, Australia, South Korea, and Russia, etc., and provides one-stop global intellectual property services to both domestic and foreign clients.

7. Science and technology information services institutions

Finally, this section will introduce the international activities of intermediary organizations related to science and technology information services. First, the Sichuan Provincial Science and Technology Information Institute (四川省科技情報研究所), as an authoritative institution in the field of science and technology information in Sichuan Province, actively conducts multi-level cooperation with foreign governments and enterprises in science and technology fields. In constructing and operating the Chengdu University of Information Technology (CUIT) International Research Institute for Robots and Smart Systems, the institute has signed cooperation agreements with CUIT and with the EZLS Institute at Siegen University in Germany. The two institutes aim to promote innovation and development of robots and intelligent systems by building high-level academic research centers and domestic and international research cooperation bases in the robotics and smart equipment industry chain and by attracting the latest domestic and foreign research and development.

Additionally, at the Beijing Academy of Science and Technology (北京市科学技术情报研究所), the Beijing Science, Technology, and Economic Information Union Center and the Beijing Science and Technology Information Society serve as the institute's points of contact for external exchanges. The Beijing Academy of Science and Technology also has good and close relations with the central government in Beijing, the CAS, university scientific research and information institutes, and overseas information institutes, and is engaged in a wide range of exchanges of human resources, technology, information, and products with regions and countries such as the United States, Russia, Japan, South Korea, and Central Asia. In recent years, as the international situation has changed, it has also been further developing international partners, with breakthroughs in countries such as Russia and Central and Eastern Europe. In June 2017 it signed a memorandum of understanding for technical cooperation with the Steinbeis Advanced Risk Technologies Group, in which it agreed to enter into project-level cooperation on new methods and tools for science, technology, and innovation risk management; technology transfer; education; research and development and consulting services; and new biofuel and coating technologies. In April 2018, it signed a memorandum of understanding for scientific and technological cooperation with the Czech Academy of Sciences (CAS), with both parties agreeing to further cooperate in areas such as the construction of science and technology information databases and the application of artificial intelligence in science and technology information. Alongside the progress of China's national Belt and Road cooperation projects, the Beijing Academy of Science and Technology is strengthening its cooperation with Asian countries. In 2019, it signed an agreement with the Korea Institute of Industrial Technology for regular technical exchanges and cooperation in areas such as robot research and development, innovation application for building smart cities, smart transportation, fuel cells, and waste-free city construction.

(9) China and large-scale international projects led by major countries

China's participation in large-scale international science and technology projects varies, reflecting the project's planning stage, the international situation, and China's own economic development. This section will examine China's involvement in large-scale international projects led by major countries in the fields of space, nuclear power, and other areas.

1. Space development

Following a call to action by United States President Ronald Regan in 1984, the International Space Station (ISS) began as a science and technology project between Japan, the United States, Canada, and Europe, with the International Space Station cooperation agreement being signed in 1988 and then entering into force in 1992. Subsequently, at the end of 1993, the Russian Federation's participation in the ISS program was officially decided, with new International Space Station cooperation agreement being created in January 1998 and then entering into force in March 2001.

In-orbit assembly of the ISS began in November 1998, and astronauts began to be stationed there in November 2000. The ISS was completed in July 2011 after more than 40 launches in partnership with 15 countries centered around the five main countries/regions of Japan, the United States, Canada, and Europe (from the Japanese Ministry of Foreign Affairs website).[150] At that time, China was in a period of reform and opening up, and was laying the foundations for its socialist market economy, so it would be difficult to say that China was in a position to participate in the ISS. Today, apart from the Japan-led Asia-Pacific Regional Space Agency Forum, China has established the Asia-Pacific Space Cooperation Organization which it leads, and has even gone so far as to construct its own space station (Tiangong).[151]

Specifically, China is planning to begin construction of its space station (launches into space) in 2021, to also begin operation in 2021, to complete construction of it in December 2022, and to operate it independently. In 2016, the China National Space Administration signed an agreement with the United Nations Office for Outer Space Affairs to open the use of the Chinese space station to United Nations member countries, and scientific experiments are being planned by 23 institutions from 17 countries, including the University of Tokyo in Japan.[152]

2. Nuclear power development

The International Thermonuclear Experimental Reactor (ITER) project, a huge international cooperation project in nuclear energy development, was also proposed around the same time as the space station mentioned above. Starting with the Joint Statement on the US-Soviet Summit Meeting (Reagan-Gorbachev) in November 1985, conceptual design and engineering design activities were conducted from 1988 to July 2001. During this time the United States temporarily withdrew from the project in 1999, but intergovernmental consultations began in November 2001, and the United States returned to the project in February 2003, while China had been participating in the intergovernmental consultations. Incidentally, in China the Institute of Plasma Physics (ASIPP) (established in 1978) began design activities for EAST, the world's first nuclear fusion reactor using superconducting magnets, in 1997, and then began construction in 2001.[153]

[150] https://www.mofa.go.jp/mofaj/gaiko/technology/universe/iss.html

[151] China is planning to begin operating Tianhe, the core module of the space station, in 2021, with construction completed by December 2022, and will operate it independently.

[152] Refer to the NHK report: https://www3.nhk.or.jp/news/html/20230105/k10013941871000.html
Refer to the Kyodo News report: https://news.yahoo.co.jp/articles/31ca6e23143a2c5a0b466e25fd16ebc88206dc16

[153] Refer to: http://jcst.in.coocan.jp/Pdf/Shanhai_Isei.pdf
Evaluations and rankings of patent applications filed in 30 countries (including Japan, the United States, Europe, and China) were used to determine China's nuclear fusion capabilities, and the results showed that China ranks first, based on the nationality of the filing organization (Japan Keizai Shimbun, 12th edition, p. 15, May 17, 2023).

At the second six-party ministerial meeting held in Moscow in June 2005, it was decided that ITER would be constructed in Saint-Paul-les-Durance, France, and full-scale operations began. China began participating in the ITER project before both South Korea (June 2003) and India (December 2005), and it appears that China was quite capable.

Under the principle that 46% of the ITER-related financial burden will be borne by Europe, where the fusion plant will be located, and 9.1% by each of the other participating countries, the project has a construction style in which each party will manufacture equipment commensurate with their technical capabilities and in a manner commensurate with their burden, and then these pieces will be brought together. China is not only manufacturing toroidal magnetic field coils and steady power supplies (which are also being jointly manufactured with the other parties), but is also independently manufacturing and supplying the neutron shielding.[154] It is also reported that presently, China is dispatching more than 100 of the approx. 1,000 ITER staff members.[155]

3. Ocean development

International ocean-related projects include the Argo project (an advanced ocean monitoring system)[156] and the International Ocean Discovery Program (IODP), and China participates in both Argo and IODP.[157]

The Argo project, in cooperation with the World Meteorological Organization (WMO) and other organizations, deploys devices (Argo floats) to automatically observe the inner ocean, and aims to monitor and understand oceanic changes around the world in real time (In Japan, the Ministry of Land, Infrastructure, Transport and Tourism participates in the Argo project in collaboration with the Ministry of Education, Culture, Sports, Science and Technology).[158] In China, the Observation and Research Station of Global Ocean Argo System (Hangzhou) of the Ministry of Natural Resources is participating as the representative organization.

IODP is a multilateral scientific research collaboration program that was launched in October 2013. IODP conducts research by using drilling ships provided by each country (Japan: deep-sea scientific drilling vessel *Chikyu*; United States: *JOIDES Resolution*; Europe: Mission-Specific Platforms) to drill into the sea floor around the world, and then collects and analyzes the geological samples (drilling cores) and analyzes data by installing borehole observation devices. In doing so, IODP works to unravel the mysteries of the earth and of life.[159] In China, the Ministry of Science and Technology is registered as a participating institution.

4. Astronomy

The Square Kilometer Array Observatory (SKAO) project is the largest and most capable radio telescope in the

154 Refer to: https://www.iter.org/proj/inafewlines#5

155 ITER China, refer to: https://www.iter.org/multilingual/io/7/340
According to the ITER homepage, each party's share is 9.1% (other than the site country). Of the approx. 1,000 staff that are directly employed by ITER (upper limit of 1,170), over 100 are believed to be Chinese nationals. Incidentally, there are 52 Japanese nationals among the ITER staff (as of the end of March 2023).

156 Refer to: China Argo Real-Time Data Center□www.argo.org.cn

157 Participating as a partner that also provides funding: https://www.iodp-china.org/En

158 From the Ministry of Land, Infrastructure, Transport and Tourism:
https://www.mlit.go.jp/hakusyo/mlit/h17/hakusho/h18/html/H2077120.html

159 https://www.jamstec.go.jp/iodp/j/about/

world.[160] The SKAO (sometimes abbreviated as SKA) is an cooperative international project to build and operate a "very large telescope for radio waves with frequencies from 50 MHz to 14 GHz,"[161] and, during its more than 50 years of operation, its aim has been to expand humanity's understanding of space and to accelerate the development of technology. The project is being hosted by Australia, and as of late 2022 construction has already started.[162] The project cost is said to be approx. 1.6 billion EUR over 10 years. There are currently 16 participating countries, including Sweden, the Netherlands, France, Spain, Portugal, Italy, Germany, Canada, China, Japan, and India, as well as the United Kingdom (where the SKAO headquarters is located) and Australia and South Africa (the two countries where the receiving antennas are being built).[163]

As for China, the Ministry of Science and Technology has been a founding member since December 2012, it signed an intergovernmental agreement in March 2019, and with the ratification of the agreement it became an official member of the SKAO Council in June 2021. After evaluations within China, 10 projects were selected, including gravity tests using pulsars and the detection of heavy waves.[164] The SKAO contact organization for China is the National Remote Sensing Center of China.

5. Life sciences

The international Human Frontier Science Program, considered to be a pioneering international projects in the fields of life science and biotechnology, is an international project that was proposed by then-Prime Minister Yasuhiro Nakasone at the Venice Economic Summit in 1987, and its aim is to promote ambitious, cutting-edge research into the complex mechanisms of living organisms and to use the results to broadly benefit humanity as a whole. In 1989, the International Human Frontier Science Program Organization (HFSPO) was established in Strasbourg, France, to carry out the project, and since 1990 it has supported innovative collaborative research across national borders and between scientists around the world, primarily through research grant programs. For young researchers it conducts projects such as fellowship programs that provide international research opportunities and an awards ceremony that brings together HFSP personnel once a year. As of 2023, there are 15 participating countries: Australia, Canada, France, Germany, India, Israel, Italy, Japan, South Korea, New Zealand, Singapore, Switzerland, the United Kingdom, the United States, and the European Commission; China is not participating.

In 1990, shortly after the launch of the HFSP, the National Human Genome Research Institute (NHGRI) (at the time, was known as the National Center for Human Genome Research (NCHGR)) launched the Human Genome Project (HGP), a 13-year quest to decipher all 3 billion base pairs in the human genome, with partners in the United States and abroad. In 1998, China established national human genome research centers in Beijing and Shanghai, and officially joined the HGP the following year.[165] In the course of the project, China was responsible for decoding the 30

[160] Instead of relying on a single, giant receiving antenna, hundreds of small receiving antennas are spread out over a wide area, which allows for better sensitivity and resolution.

[161] Refer to: https://astro-dic.jp/square-kilometre-array/

[162] Refer to: https://research.csiro.au/ska/ska-global/

[163] Refer to: https://www.skao.int/en/partners

[164] Refer to: https://www.skao.int/en/partners/skao-members/372/china

[165] https://spc.jst.go.jp/sciencetech/s01/1_ls/1_2ls.html

million base pairs on the short arm of chromosome 3, which is 1% of the genome. Chinese researchers completed the creation of their map at the end of April 2000, and the HGP was completed in April 2003.

6. Large-scale international cooperation projects related to academia

As for large-scale international cooperation projects related to academia, refer to Roadmap 2020 Working Group on Large Scientific Research Projects by the Research Environment Infrastructure Subcommittee, Science Committee, Council for Science and Technology for more details.[166] In terms of cooperation with foreign countries, the roadmap states that, "While utilizing European and American promotion plans, Japan will clarify the division of roles and build collaboration and cooperation systems with researchers and research institutes from overseas, and, utilizing this roadmap, will promote international collaboration and international cooperation while also being more aware of them." 15 projects are specifically listed, including ones in the humanities and social sciences, basic medicine, physics, informatics, and chemistry. Of these, physics-related projects account for the majority (8), with topics such as the "Super B-Factory Project at KEK" and "Quest for the origin and evolution of universe and matter with high-intensity proton beams."

According to the above roadmap, Tsinghua University is participating in the "New developments in neutrino physics at Super-Kamiokande" project (note that via the above roadmap it is difficult to confirm all participating countries and institutions).

In the international cooperation projects related to the ALMA telescope, which is also positioned as a physics-related part of this roadmap, the telescope's construction and operational costs are distributed between the European Southern Observatory (ESO), the National Science Foundation (NSF) of the United States and its partner institutions the National Research Council (NRC) Canada and the Ministry of Science and Technology (MoST) of the Executive Yuan in Taiwan, and the National Institutes of Natural Sciences (NINS) of Japan and its partner institutions the Academia Sinica (AS) of Taiwan and the Korea Astronomy and Space Science Institute (KASI), with no participation from China.

Although this cannot be said to be an exhaustive list, it would be interesting to trace the history of China's presence in large-scale international projects led by major countries other than those mentioned above.

166 「"Formulation of a roadmap for fundamental concepts for promoting large scientific research projects: Roadmap 2020," September 24, 2020, Working Group on Large Scientific Research Projects, Research Environment Infrastructure Subcommittee, Science Committee, Council for Science and Technology, https://www.mext.go.jp/content/20210511-mxt_gakkikan1388523_2.pdf

9 Institutions of Higher Education

The number of higher education graduates in China exceeded 10 million in 2021. Guidelines for internationalization in higher education, that is, universities, are laid out in Chapter 16, "Further Opening China's Education" of the "National Plan for Medium and Long-Term Education Reform and Development (2010-2020)."[167] Here, specific policies are presented for "Promoting international exchanges and cooperation," "Introducing quality education resources abroad," and "Upgrading exchanges and cooperation." What is particularly noteworthy is that, along with internationalization, the plan "advocates for promoting the development of educational reforms to increase international status, influence, and competitiveness, and this clearly indicates that internationalization, educational reforms, and the strengthening of national power will be developed together."[168]

On the other hand, it is not clear how China's higher education is positioned with regard to the Bologna Process,[169] which is an international tuning process in Europe to clearly define the objectives, learning outcomes, and resources required for the competencies to be developed in higher education courses and subjects, and to form a common understanding amongst universities. However, in China there appears to be a situation in which the Ministry of Education is taking the lead in examining subject-specific tuning based on the Bologna Process.[170]

Apart from the activities of the Bologna Process, which aims to guarantee the international quality of higher education within Europe and to therefore ensure international mobility, China is actively engaged in forming international cooperative relationships in its higher education. Next, a portion of these efforts will be introduced.

(1) Sino-foreign joint education (joint venture universities or projects)

Higher education-related international cooperation has developed in China due to China's unique historical background. It is well known that around 1920, the United States used the Boxer rebellion reparations repayment fund to build the foundation of today's Tsinghua University and to invite talent students to the United States,[171] but, at the time, France was also planning to use the reparations as funding to establish Sino-French universities in both countries, and in June 1921 the French Senate is said to have allocated the money for the educational expenses of

167 Full text: http://www.gov.cn/jrzg/2010-07/29/content_1667143.htm

168 Yukari Matsuzuka and Fukuetsu Sono, "Tuning as Quality Assurance and Mobility Policy: What the EU Framework Suggests for China and Japan," https://arinori.hit-u.ac.jp/pdf/JapanChinaHEF6-MatsuzukaYuanJ.pdf

169 Activities based on the declaration signed by the higher education ministers of 29 European countries in Bologna, Italy, on June 19, 1999. The "Bologna Process" refers to a series of reforms for higher education systems in Europe that began with the declaration, and their aim is to adopt easy-to-understand and comparable degree systems and to introduce a two-stage study structure of undergraduate and graduate programs in all countries. https://www.niad.ac.jp/consolidation/international/info/1272551_3028.html

170 Yukari Matsuzuka and Fukuetsu Sono, *op. cit.*

171 Japan also established Institutes of Oriental Studies in Tokyo, Koyto, and Beijing. Refer to: Changgong He (author), Teiichi Kawata and Tokihiko Mori (translators), "Reminiscences of French Labor and Frugality: The Origins of the Chinese Communist Party," February 25, 1976, Iwanami Shinsho.

Chinese students.[172] As such, China has a long history of international cooperation in higher education.

At the beginning of China's reforms and opening up, Sino-foreign joint education, represented by Sino-foreign joint venture universities, was essentially promoted with the understanding of "attracting investments" in education, and was referred to as "joint education" (合資弁学). Then, in the 1990s, enrollment increased significantly. In order to compensate for the lack of educational resources (educational expenses and lack of instructors, etc.), foreign educational resources were introduced through Sino-foreign joint education, and, with the intervention of foreign educational industries,[173] in the 2000s China responded to diversifying educational needs and in the 2010s aimed to improve the quality of its education. Furthermore, it can also be seen that China has aimed to globalize its education through the creation of premier universities and premier departments.

The legal framework for Sino-foreign joint education are the "Regulations of the People's Republic of China on Chinese-Foreign Cooperation in Running Schools"(enacted in September 2003), which state that "Chinese-foreign cooperation in running schools shall abide by the laws of China, implement China's educational policies, comply with Chinese public ethics and shall not jeopardize China's sovereignty, security and public interests."

The following is primarily based on a keynote speech, "Policy goals for school management through Chinese and foreign cooperation and conditions for achieving them (中外合作办学的政策目标及其实现条件)"[174] by Prof. Jinhui Lin on September 19, 2018 that was given at the 9th National Annual Conference on Sino-Foreign Cooperation in School Management (September 17-19, 2018, Shandong Province), with some details added from the perspective of educational policy goals.

In February 2016, the State Council Issued the "Opinions on Good Jobs for the Start of the New Era in Education," which stated that Sino-foreign joint education had entered into a new stage of improving its quality and efficiency. The policy goals of Sino-foreign joint education in the new era are said to be to strengthen the role of Sino-foreign joint education and to promote education and teaching reforms. Specifically, it aims to promote the construction of academic disciplines and the reform of administrative systems and mechanisms within universities, and particularly to promote reforms for the role of Sino-foreign joint education in building premier universities and academic fields. Additionally, it will promote national education and teaching reforms and build a "dual premier", promote Chinese language education to world education centers, and provide "Chinese wisdom" and "Chinese plans" for global educational reforms and the formulation of educational rules. Sino-foreign joint education is also supposed to fully implement the CCP's educational policies and to serve the overall situation of the CCP and the state. In addition to contributing to educational policy, it is also hoped that Sino-foreign joint education will contribute to the construction of the Belt and Road and to the establishment of Sino-foreign cultural exchange mechanisms. According to Prof.

[172] *Ibid,* pp. 197-201. The Sino-French universities had strong commercial ties to Lyon, which had previously had a silk producing region, and it was decided that a university would be located there. In addition, at the time, Chinese students were being sent to study as part of the labor force during the WWI, and while it was hoped that students like this (called "hard-working and frugal students") would advance, this was not necessarily achieved, and is said to have led them to join labor movements and to join in the early activities of the Chinese Communist Party (in fact, both Zhou Enlai and Deng Xiaoping both studied abroad in France).

[173] Jun Wada, professor at Kanda University of International Studies professor, published an article in the June 28, 2003 issue of the Weekly Toyo Keizai entitled,"With the regulations on Sino-foreign joint education being enforced, Japan should also invest in education in China," and expressed the opinion that Japanese educational institutions should also seriously consider joint education in China. Refer to: http://www2.kuis.ac.jp/icci/member/wada/ronko/030628_t.pdf

[174] Jinhui Lin,「中外合作办学的政策目标及其实现条件」(基調講演、第9回中外協力全国年次大会2018 年9月17～19日、山東省) https://cfcrsorg.xmu.edu.cn/info/1101/2313.htm

Jinhui Lin's speech, in recent years it has been said that Sino-foreign joint education should strengthen Party-building efforts. For example, when applying to projects by Sino-foreign joint educational institutions, content related to Party-building must be included in the application, and that an "Explanation of Party-Building Work" must be added to self-evaluation reports. It will be very interesting to see what kind of effect such demands will have on the cooperative stance of the United States and European countries in Sino-foreign joint education.

On May 2, 2018, President Xi Jinping gave a speech to teachers and students at Peking University in which he pointed out the importance of correctly handling the basic relationship in realizing the policy goals of Sino-foreign joint education; emphasized the relationship between introduction, absorption, and integration of innovation in addition to the issue of education itself; and stated that the introduction of high-quality foreign educational resources refers to world-class level and management of schools, superior education, and human resource development models, as well as premier foreign universities, distinctive majors, and high-level teachers. In particular, he noted that rankings of universities around the world serve as a reference for determining their quality. To date, various legal developments have been underway to give concrete form to the content of President Xi Jinping's speech.[175]

Furthermore, at a national education conference in September 2018, President Xi Jinping pointed out that, "We need to expand the opening up of education and engage in high-level cooperation with world-class resources in school management."

Sino-foreign joint education that has developed in this way can be classified into three types: (1) joint venture Sino-foreign universities (Chinese and foreign university with an independent character), (2) joint ventures and projects between the faculties/academies of Chinese and foreign universities, and (3) joint ventures on majors between Chinese and foreign universities. There are a total of 10 joint venture universities with an independent legal character, or 12 if Hong Kong and Macau are included (refer to Table 4). There are those that have undergone an establishment review by the Ministry of Education and those that have been reviewed by their province/autonomous region/directly-controlled government and then had a report sent to the Ministry of Education. According to "Overview of China's Major Universities and Research Institutions 2022,"[176] in total the types/projects listed above cover 156 schools. It appears that 98 universities (63%) clearly operate science and engineering undergraduate and graduate programs. The countries in which universities, including those in the fields of the science, technology, and the humanities, jointly operate with the Chinese side are: the United States (26 universities), the United Kingdom (23 universities), France (17 universities), Australia (16 universities), Germany (12 universities), Russia (10 universities), Canada (10 universities), Ukraine (3 universities), and Japan (3 universities), etc.

175 Such as the "Private Education Promotion Law" (2002), "Regulations of the People's Republic of China on Chinese-Foreign Cooperation in Running Schools" (2003), "Implementation Measures for the Regulations of the People's Republic of China on Chinese-Foreign Cooperation in Running Schools" (2004), "Implementing Regulations on the Private Education Promotion Law of the People's Republic of China" (2004), "Notice by the Ministry of Education Regarding Matching with Chinese-Foreign Cooperation in Running Schools and Programs" (2004), "Opinions of the Ministry of Education on Relevant Issues concerning Current Sino-foreign Cooperative Education" (2006), and "Notice by the Ministry of Education Regarding Further Regulations on the Order for Chinese-Japan Cooperative Education" (2007)

176 Refer to: https://spc.jst.go.jp/univorg/index.html

Table 4: Types of Sino-foreign joint universities (with independent legal character)

1616	郑州亚欧交通职业学院	4141014685	河南省教育厅	郑州市	专科	中外合作办学
1958	深圳北理莫斯科大学	4144016409	广东省	深圳市	本科	中外合作办学
1959	广东以色列理工学院	4144016410	广东省	汕头市	本科	中外合作办学
706	上海纽约大学	4131016404	上海市教委	上海市	本科	中外合作办学
807	西交利物浦大学	4132016403	江苏省教育厅	苏州市	本科	中外合作办学
808	昆山杜克大学	4132016406	江苏省教育厅	昆山市	本科	中外合作办学
875	苏州百年职业学院	4132013962	江苏省教育厅	苏州市	专科	中外合作办学
957	宁波诺丁汉大学	4133016301	浙江省教育厅	宁波市	本科	中外合作办学
958	温州肯恩大学	4133016405	浙江省教育厅	温州市	本科	中外合作办学
1217	福州墨尔本理工职业学院	4135016411	福建省教育厅	福州市	专科	中外合作办学
1956	北京师范大学-香港浸会大学联合国际学院	4144016401	广东省教育厅	珠海市	本科	内地与港澳台地区合作办学
1957	香港中文大学（深圳）	4144016407	广东省教育厅	深圳市	本科	内地与港澳台地区合作办学

Source: From "Major Sino-Foreign Joint Universities" by Science Portal China

In China, joint venture universities are said to have several major advantages. First, there is the afore-mentioned generous policy support, the environment of being able to study in China, and the fact that it is possibly to apply in conjunction with the unified entrance examination is seen as an insurance policy. Compared to studying abroad, joint venture universities have lower costs and the hurdles for admission are lower, but the quality of education (instructions) is high. For the students graduating from these universities, because they can earn a degree from an overseas university that they have an advantage if deciding to continue on to an overseas graduate school, and, unlike the so-called "sea turtles" who went abroad and are now returning home, they have an advantage in finding employment because they are familiar with the domestic situation (and have familiarity with the areas).

On the other hand, according to the Ministry of Education, 286 joint venture projects have been terminated, with the most common reason for termination being due to discussions between both the Chinese and foreign universities, as well as other factors to be considered such as a lack of educational resources and declines in quality.[177] This includes projects from 985 universities, including Tsinghua University and Peking University, which has raised some concerns and questions. While studying abroad has significant costs, the joint venture universities make it possible to obtain dual diplomas, both from home and from abroad, without actually having to go abroad, with some viewing this as a violation of fairness. Additionally, some Sino-foreign joint educational programs use the names of famous universities

[177] Refer to: http://www.moe.gov.cn/jyb_xxgk/s5743/s5746/202108/t20210823_553575.html

and then indiscriminately admit students, and, by paying high tuition fees, even with low scores some students are able to study within Project 211 and Project 985.

Recent changes in Sino-foreign joint education are as follows.[178] First, there is a reconsideration of the concept of internationalization, and a change in the way of thinking such that regional internationalization (or "at-home" internationalization) can lead to more convenient and effective educational exchanges and cooperation. Second, amidst the COVID-19 pandemic, there has been a shift in positioning on realizing the desire to study abroad, with it being seen as an opportunity to transform the traditional education model (during the COVID-19 pandemic, in 2020 94 Sino-foreign joint venture institutions and programs temporarily expanded their enrollment to 3,031 students, which became an important channel for online and offline learning for students who should have studied abroad). Third, internationalization so far has merely been Westernization, or an imitation of such, but there is a change in direction toward Sinicization and distinctiveness, which means that going forward, emphasis should be placed on promoting distinctive development in accordance with the needs of the state and of society. Fourth, a development can be seen from traditional educational methods towards digital hybrid education, and, by replacing overseas study with overseas education, there is a conversion to a "traditional + digital" class model.

Although the literature only goes until 2016, generally speaking it has been pointed out that Japanese educational institutions are lagging behind in entering the Chinese educational market when compared to educational institutions in the United States, the United Kingdom, or Australia, and in addition, Sino-foreign university-related issues that are being discussed include public interest, commercial viability, the balance of regional distribution between inland and coastal areas, and systems for guaranteeing the quality of education.[179] However, the discussions from the Chinese perspective of trying to increase its presence in science, technology, innovation, and academia have yet to be seen. Considering the recent US-China conflicts and the expression of the G7's different values towards China, it will be necessary to sort out fundamental questions about trends related to Sino-foreign universities that should be analyzed and evaluated in the future.

(2) Overseas branch schools

The establishment and operation of overseas universities within China is as described above, but since the time of President Jiang Zemin, China has also been working to create world-class universities through Project 211 and Project 985. In the 2000s, although advanced universities in Europe and the United States became more active in establishing overseas schools,[180] in 2013 and the birth of the Xi Jinping administration, the creation of "world-class universities" gained momentum. Recently, there have been media reports stated that "overseas education leads to improvements in soft power," and there is a growing view that emphasizes the significance of widely expanding China's higher

178 Refer to: https://m.gmw.cn/baijia/2021-09/16/35169399.html

179 Lin Ye , "Chapter 3: New Developments in Sino-Foreign Joint Universities," Futao Huang and Min Li, eds., Hiroshima University Research Institute for Higher Education, "Changes and Trends in Higher Education in China: Focusing on Developments Since 2005," Reviews in Higher Education No. 132, March 2016.
Refer to: https://ir.lib.hiroshima-u.ac.jp/files/public/3/39959/20160512133421426292/RIHE132.pdf

180 Around 2011, there were said to be 162 overseas university campuses around the world, with 78 in the United States, 14 in China, and 13 in the United Kingdom, etc. Refer to: China Education News (July 5, 2011)
https://wenku.baidu.com/view/a6f6b86cbd1e650e52ea551810a6f524cdbfcb70.html?_wkts_=1680920362883&bdQuery=%E4%B8%BA%E4%BD%95+%E6%B5%B7%E5%A4%96%E6%A0%A1%E5%8C%BA

education system and educational content overseas.[181]

Article 2 of the "Regulations of the People's Republic of China on Chinese-Foreign Cooperation in Running Schools" states that, "These Regulations apply to the activities of the cooperation between foreign educational institutions and Chinese educational institutions in establishing educational institutions within the territory of China to provide education service mainly to Chinese citizens," but later, the Malaysian branch of Xiamen University was China's first overseas school, the Global Innovation Exchange Institute was established by Tsinghua University in Seattle in the United States, and a joint academy with Zhejiang University was established with Imperial College London within its grounds, and there is a history of Chinese universities expanding overseas and establishing joint venture universities.

It was also said that higher education via China's educational system and content "is a long-term investment for China to help more young people embrace Chinese values." For example, it has been pointed out that Ethiopian President Mulatu Teshome is a graduate of Peking University, and Kazakh Prime Minister Karim Massimov studied at Wuhan University.

In an increasingly globalized world, learning and adopting advanced educational philosophies, teaching methods, and international curriculum systems is the only way to develop an international elite, and the establishment of overseas campuses was also seen as an urgent necessity.[182] The example of the Global Innovation Exchange Institute, established by Tsinghua University in Seattle in the United States, is discussed above.

In 2015, the "Interim Measures for the Administration of Colleges and Universities Engaged in Overseas Education (高等学校境外办学暂行管理办法)"[183] were abolished, thereby eliminating the need for administrative permission to establish overseas branches and granting autonomy to universities. Furthermore, in 2019 the Ministry of Education established the "Guidelines for Overseas University Management (Trial) (2019) (高等学校境外办学指南)," which provide standards and policies, etc. related to the establishment of branch schools.[184]

There are three basic patterns for overseas branch schools:

(a) A Chinese university establishes its own branches overseas (e.g. Xiamen University's Malaysia branch)

(b) A Chinese university and a foreign university collaborate to establish a branch (e.g. Tsinghua University's Global Innovation Exchange Institute)

(c) The local government or a local company lead the branch, and it managed to some extent independently from the Chinese university (e.g. Beijing Language and Culture University, Tokyo College)

Overall, there are many overseas branch schools in Asia, in developing countries, and in countries along the Belt and Road, and fewer in Europe and in the United States.

There are currently 22 overseas branches of Chinese universities. Tsinghua University, Peking University, Zhejiang University, Shanghai Jiao Tong University, and Fudan University are all expanding overseas. Specifically, these include the Xiamen University Malaysia (opened in 2012); the Global Innovation Exchange Institute that was established by Tsinghua University and the University of Washington in Seattle in the United States (opened in June

181 Refer to: http://panjin.dlut.edu.cn/info/1035/10944.htm

182 Refer to: https://www.sohu.com/a/234157564_100074

183 Refer to: http://www.moe.gov.cn/srcsite/A02/s5911/moe_621/200212/t20021231_81852.html

184 Refer to: https://iro.wzu.edu.cn/__local/8/3D/62/31CEB83337885A7EC984D7DE416_0203C1F6_3B2011.pdf?e=.pdf

2015);[185] the South Kensington Campus branch by Zhejiang University and Imperial College London (opened in 2015); Peking University HSBC Business School UK Campus (opened in 2017) via the purchase of the Oxford campus through an agreement between Peking University, HSBC Business School, and the Open University of the United Kingdom; the SJTU Asia-Pacific Graduate Institute by Shanghai Jiao Tong University (announced in November 2019); Sino-French Engineer School of Beihang University, which is the first Sino-French joint educational institution in the field of aviation, was established by Beihang University and Le Groupe des Ecoles Centrales; the Alberta Institute of Wenzhou Medical University, which was jointly established by Wenzhou Medical University and University of Alberta Faculty of Medicine & Dentistry as the first Sino-Canadian collaboration focused on clinical medicine; and Kyiv Institute at Qilu University of Technology, which was jointly established by Qilu University of Technology and Kyiv National University of Technologies and Design in Ukraine. In April 2021, Fudan University and the Hungarian government officially signed a strategic cooperation agreement online, deciding to jointly build Fudan University's Hungarian campus in Budapest (with a planned 10,000 students). This overseas school will be the first branch of a Chinese university in the EU, and, after the plan was revealed in June 2021, it has become a politically sensitive issues with strong opposition to the Hungarian government.[186]

In Japan five schools have been established and are operating: the Japan branch of the Tianjin University of Traditional Chinese Medicine (opened in September 2006, and teaches systemic traditional Chinese medicine); Beijing language and Culture University, Tokyo College (opened in April 2015, and is a university created for international students), Jinan University Japan Campus (opened in October 2021, and is a university for Chinese nationals living abroad and known as the "best academic institution for overseas Chinese nationals"); Shanghai University Tokyo Campus (opened in April 2019), which was recently established and is promoted as a comprehensive university; and Tokyo College of Shenzhen University (opened in April 2023) (All schools other than Tokyo College of Shenzhen University are listed as "educational facilities with foreign university courses" on the website of the Ministry of Education, Culture, Sports, Science and Technology, and the Jinan University Japan Campus is also registered as an "educational facility offering foreign graduate school courses.").

(3) Other educational and cultural institutions

1. Confucious Institutes

According to the website of the Chinese International Education Foundation, Confucious Institutes are non-profit educational institutions that are established through Sino-foreign cooperation. They are organizations whose purpose is to promote the spread of the Chinese language, deepen understanding of Chinese language and culture amongst people around the world, promote cultural exchanges between China and foreign countries, and contribute to continued world peace and mutual development.[187] As of 2020, there are said to be 540 Confucius Institutes and 1,154 Confucius Departments (facilities set up at educational institutions below university level) in 162 countries and

185 It is said that 3,616 Chinese students were enrolled when the institute was established, and Microsoft reportedly provided financial support of 40 million USD per year (see footnote above).

186 Refer to: https://www.rferl.org/a/hungary-orban-china-fudan-budapest/31888800.html

187 Refer to: https://www.cief.org.cn/kzxy

regions.[188] In Japan, 13 privates universities (as of May 2023) have established one, including Ritsumeikan University (opened in 2005) and Waseda University (opened in 2007).[189]

In Japan,[190] Europe, and the United States,[191] there has been debate about the transparency of Confucius Institutes in terms of organizational management and activities, and in some cases they have been closed (for various reasons). In the United States, under the National Defense Authorization Act of 2021, universities implementing Confucius Institute programs are prohibited from receiving funding from the Department of Defense, and the National Academy of Sciences (NASEM) issued a report (January 10, 2023) on the criteria to be considered when studying exemptions from this funding limitation and outlines specific actions to be taken by the federal government.[192] The French Senate has also compiled a report on the subject of "better protecting our country's scientific property and academic freedom," which notes that the 17 Confucius Institutes are one form of exercising foreign influence.[193]

2. International cooperation institutions between universities (international university associations)

Several organizations have been established to promote collaboration and cooperation between higher education institutions in Asia or the Asia-Pacific region, but here only the main ones that can be found on the internet will be listed, bearing in mind the presence of China.

(a)University Mobility in Asia and the Pacific (UMAP)[194]

UMAP is a voluntary organization consisting of governmental and non-governmental representatives in the field of higher education, and was established in 1991 for the purpose of promoting exchanges of students and faculty

188 By the Musashi University Confucius Institute. https://www.musashino-u.ac.jp/confucius/about/

189 In the "Survey of and Research Report on the Actual Activities of Foreign Universities in Japan," which was a survey commissioned by the Ministry of Education, Culture, Sports, Science and Technology in 2020 there were 15 schools in March 2021 (Refer to: https://www.mext.go.jp/content/20210804-mxt_daigakuc03-000017258_01.pdf). In the "Reply to Questions Submitted by House of Councilors Member Sohei Kamiya Regarding Confucius Institutes Established in Japan" dated May 12, 2023, it was answered that, as far as the Government of Japan knows with respect to "Confucius Institutes" and "Institutions similar to Confucius Institutes," as of April 2023 there were at least 13 "Confucius Institutes" that had been established in Japan, and that, specifically, the Government of Japan was aware that "Confucius Institutes" had been established at Ritsumeikan University,
J. F. Oberlin University, Hokuriku University, Aichi University, Ritsumeikan Asia Pacific University, Sapporo University, Osaka Sangyo University, Okayama Shoka University, Waseda University, Fukuyama University, Kansai Gaidai University, Musashino University, and Yamanashi Gakuin University. Refer to: https://www.sangiin.go.jp/japanese/joho1/kousei/syuisyo/211/touh/t211063.htm

190 At the Ministry of Education, Culture, Sports, Science and Technology's Central Education Council, University Subcommittee, International Students Special Committee considerations (summary) of specific measures based on the "Outline of the 300,000 International Students Plan" (July 8, 2008), citing the example of Confucius Institutes, it was stated that "It is hoped that, in the future, related organizations will work together to spread the Japanese language overseas by referring to initiatives like this," and on May 12, 2023, in the Government of Japan's response to the letter of intent, the Government of Japan stated, "We urge the public disclosure of information regarding operations, etc., as it is necessary to ensure transparency."

191 In the United States, the 2019 report by the National Association of Scholars is cited.
Refer to: https://www.nas.org/academic-questions/32/2/the-confucius-institutes/pdf

192 "NASEM Proposes DOD Funding Criteria for Universities Hosting a Confucius Institute,"
January 10, 2023, National Academy of Sciences, Daily Watcher, JST/CRDS Overseas Trends Unit, refer to: https://crds.jst.go.jp/dw/20230217/2023021734606/

193 For the summary version of the Senate report on this research mission, "MIEUX PROTÉGER NOTREPATRIMOINE SCIENTIFIQUE ET NOS LIBERTÉS ACADÉMIQUES," refer to: http://www.senat.fr/rap/r20-873/r20-873-syn.pdf

194 Refer to: https://umap.org/

amongst higher education institutions in the Asia-Pacific region. At its launch, the Australian Vice-Chancellors' Committee (AVCC), in cooperation with the Australian government, invited university officials from Japan, South Korea, Taiwan, and Hong Kong to conferences (held in Hong Kong in April 1991 and in Canberra in September 1991) discuss cooperation in the field of education in the Asia-Pacific region. 18 countries and regions attended the Canberra conference, and it was resolved that the participating countries would become the UMAP International Conference. In August 1998, the UMAP Constitution was adopted at the 6th UMAP International Conference held in Bangkok. In its constitution, it is stipulated that, "The general aim of UMAP is to achieve a better understanding within each of the countries and territories in the Asia-Pacific region of the cultural, economic and social systems of the other countries and territories in the region through enhanced cooperation among higher education institutions and increased mobility of university students and staff," and the objectives of UMAP's activities are as follows:

- ➡ To identify and overcome impediments to university mobility.
- ➡ To promote bilateral, multilateral and consortium arrangements among universities of member countries/territories.
- ➡ To develop and maintain a system for recognition and transfer of credits (the UMAP Credit Transfer Scheme (UCTS) is currently in operation)

Currently, there are 36 participating countries and regions as members of UMAP, and 21 countries and regions, including China and the four countries and regions at its inception, make up the UMAP Board.

(b)ASEAN University Network (AUN)[195]

Next, at the ASEAN Summit in the early 1990s, the importance of developing human resources with a unique regional identity was recognized, and there were calls for strengthening the networks among major universities and research institutions. In response to this, the AUN Charter[196] was agreed upon and established in 1995. In accordance with its charter, AUN conducts activities that contribute to the development of advanced human resources and to improving the quality of higher education in ASEAN member countries. Currently, 30 universities and research institutes from ASEAN member countries are participating. The Executive Director is Chholtis Dhirathiti of Chulalongkorn University (Thailand).

The ASEAN+3 University Network (ASEAN+3 UNet) was established in 2012 as a sister network to AUN. Five universities from China, six from South Korea, and ten from Japan are participating in the ASEAN+3 UNET. The participating universities from China are Guangxi University, Guizhou University, Peking University, Xiamen University, and Yunnan University.

(c)Association of the Universities of Asia and the Pacific (AUAP)

In 1995, around the same time as AUN, the Association of the Universities of Asia and the Pacific (AUAP) was established in Thailand in July with the aim of providing a platform for mutual communication and cooperation amongst higher education institutions (universities) in the Asia-Pacific region and positioned as having the highest formal consultative status with UNESCO.[197] AUAP is an international organization that holds regular conferences and

[195] Refer to: https://aunsec.org/

[196] Refer to: https://aunsec.org/

[197] One of UNESCO's two partnership categories. The other is associate status.

workshops to resolve important issues.[198] As far as can be confirmed, in addition to university presidents from China (including Macau), university presidents from Thailand, Australia, Indonesia, Bangladesh, South Korea, Malaysia, the Philippines, and Iran are also participating in AUAP.[199] According to the AUAP website, for its 2023-2026 activities it aims to promote cooperation between industry and academia by holding annual conferences and program meetings, to promote peace through education, and to promote global leadership. The AUAP Annual Conference is scheduled to be held at Siam University in Bangkok in November 2023. A President and two Vice-Presidents will be elected from Bangladesh, India, and Romania, respectively. The Advisory Council consists of 23 people in total, including six from Thailand, four from India, two from Pakistan, and one from each of eleven countries, including Bangladesh, Indonesia, Iran, Australia, Pakistan, the Philippines, and Malaysia, etc.[200] Initiatives from Thailand and India are also strongly felt. Incidentally, it can also be confirmed that Asia University is participating from Japan.

(d)Association of East Asian Research Universities (AEARU)

The mid-1990s seem to have been an era when there was a growing desire to form networks amongst the universities in this region, and in January 1996, the Association of East Asian Research Universities (AEARU)[201] was established. AEARU aims to create a forum for presidents of major research-oriented universities in the East Asia region and to provide opportunities for the mutual exchange of opinions, and is developing activities that contribute to improving the quality of higher education and research in the region as well as contributing to the construction of a new era that will lead to cultural, economic, and social development. AEARU's governance consists of a Chairperson, Vice-Chairperson, and other Board of Director members selected from five areas (mainland China, Japan, South Korea, Hong Kong, and Taiwan). A total of 18 universities from the region are reported to have been members since its inception, and, based on the results of the 2021 Annual General Meeting, 19 universities are members, of which 16 universities participated in the meeting (Japan: six, China: four, South Korea: 4, Hong Kong: 1, Taiwan: 1). AEARU's activities include holding workshops, student summer camps, and international symposiums, which are conducted via a rotation among member universities and at the expenses of each member university. Although a list of members is not provided, the current Chairperson is Xinhe BAO of the University of Science and Technology of China. The term of office is two years, and since 2010 the position has been rotated to Hong Kong, China, South Korea, Japan, and Taiwan.

(e)Alliance of Asian Universities (AUA)

Finally, the Alliance of Asian Universities (AUA) will be highlighted. The AUA is an international organization that was officially launched at Tsinghua University in April 2017 based on a March 2016 proposal from Tsinghua University.[202] AUA's objectives are to utilize education resources amongst member universities to develop future leaders; to create an innovative collaborative ecosystem between academia, industry, and government; and to

198 https://www.chea.org/international-directory/association-universities-asia-and-pacific

199 https://en.wikipedia.org/wiki/Association_of_the_Universities_of_Asia_and_the_Pacific

200 https://auap.org/advisory-council

201 https://www.aearu.com/ "AEARU" is pronounced in the same way as the Japanese verb for "to meet with".

202 http://www.asianuniversities.org/About/History_of_AUA.htm

strengthen collaboration and exchanges amongst member universities involved in education and research.[203] The member universities are relatively limited, and include Chulalongkorn University, King Saud University, United Arab Emirates University, University of Colombo, Hong Kong University of Science and Technology, National University of Singapore, Seoul National University, Universitas Indonesia, University of Tokyo, Indian Institute of Technology Bombay, Nazarbayev University, Tsinghua University, Universiti Malaya, and University of Yangon.[204] The Chairman for the 2020-2023 period is WANG Xiqin, President of Tsinghua University, and the Secretariat is located at Tsinghua University.

[203] http://www.asianuniversities.org/About/Mission.htm

[204] http://www.asianuniversities.org/About/AUA_Members.htm

10 Conclusion

As mentioned above, although efforts were made to ascertain and lay out the facts as widely as possible, it cannot be denied that there are still some aspects that remain to be fully grasped. However, despite the current state of this report, the authors believe that China's presence in international science and technology activities can be seen as follows:

(1) Regarding scientific journals, China has been making extensive efforts to improve the quality of its scientific journals by formulating excellence journal plans and investing public funds, but, from an international standpoint, it is felt that they need to attract more attention from researchers around the world. In fact, it can be seen that "Chinese scientists also believe that there is still much room for improvement in terms of international influence on scientific journals, attracting foreign talent, and China's influence in international science and technology organizations."[205] In the time remaining until 2035, the target year for China to achieve its goal of becoming the world's number one scientific journal in terms of overall strength, it will be important to keep an eye on future trends, including the reactions of researchers in Japan, Europe, and the United States. On the other hand, against the backdrop of the remarkable achievements of China's research and development and academic research, its presence is clearly visible in the number of Chinese editors at major European and American scientific journals and in the number of Chinese nationals invited to cutting-edge research conferences, so it can be said that Chinese researchers are being highly evaluated in some fields and on some issues.

(2) In terms of international conferences and conventions, there is a need to conduct broader research on participating countries, participants, frequency, invited/keynote speakers, and their themes, etc., but at present it can be said that there are conspicuous activities under frameworks such as the Belt and Road Initiative. If China's planning and holding of research conferences on internationally cutting-edge issues go beyond this framework and involves a wider range of countries and regions and becomes more established, then it would show that China's initiatives are also gaining momentum.

(3) As for international organizations, there was a time when a relatively large number of specialized United Nations agencies were headed by Chinese officials, but the number of such agencies has decreased in recent years. On the other hand, it seems that there is active relationship forming with countries and regions through cooperative activities such as the Belt and Road, and it will also be important to analyze and evaluation the power relations amongst countries regarding the various candidates in elections for the top positions at specialized United Nations agencies. Although the situation is likely to become considerably more complex, generally speaking, when it comes to the relationship between countries and international organizations, it is necessary to look closely not only at governance, but also at trends in the number of staff,

[205] Beijing News, [23-004] <Open Innovation> Considerations of Chinese Science and Technology Workers Towards Open Innovation, JST Beijing Office, January 17, 2023. Refer to: https://spc.jst.go.jp/experiences/beijing/bj23_004.html

the amount of special contributions, and the beneficiary countries, etc.

(4) In international projects as well, China has been keen on strengthening human resource development, especially in the context of its Belt and Road Initiative. Although broader and deeper research is needed, China's active participation in large-scale international cooperation projects in oceanography and astronomy, etc. can be confirmed, and there are also examples of large-scale project such as ITER, which have been underway long before the US-China conflict became apparent, where there has been an increase in the number of personnel from China who are dispatched. Furthermore, there are also examples of China proactively proposing and leading international cooperation projects to address global environmental issues. However, in matters such as space station construction or cooperation between Asian space agencies, China is not participating in existing Western projects or in international organizations, and is instead making moves on its own.

(5) Higher education-related international cooperation has been developed due to China's unique historical background, but recently there have been harsh views taken towards Sino-foreign universities, and it appears that it will be difficult for the situation to proceed as expected by the Chinese government. It also seems like it will not be easy for China to strengthen its initiatives even more than it has already done so because institutions such as Confucius Institutes that focus on language and cultural activities are not necessarily being treated in the same way as they have been in the past, particularly in the United States and France.

Taking an international initiative, whether it be an international conference or an international project, means having the power to set various agendas based on certain values, and it gives a country a relative advantage in acquiring and disseminating information that is in line with its interests and concerns, and, as a result, taking international initiatives like this is one method that can be used to create an intellectual balance that can result in a country outperforming its counterparts. In international organizations, this kind of agenda setting is often of critical importance, and the consequences are likely to be especially significant when it comes to health and medical issues such as infectious disease control or environmental issues such as the measures to address global warming. As mentioned at the beginning, it is only natural for any countries to pursue such initiatives if it is considering its national interests and its national and economic security.

Countries that have been considered to be developed countries throughout the last century are represented by the US-led Japan-United States Educational Exchange Promotion Foundation (commonly known as the Fulbright Foundation), the British Council in the United Kingdom, the Goethe Institut in Germany, and the Alliance Française in France. Each of these countries has achieved its current prosperity as a result of its efforts to integrate outstanding students and researchers into its own language, culture, and academic sphere, and to build and develop its own cultural and economic spheres in the world, and it can be said that the development of human resources and the development and construction of the country's culture and economy have become integrated. In the world of science, technology, and academia, the strategies that China is taking up today cannot be said to be particularly unique, and, indeed, it can be said that China is walking down a natural path.

It is unclear what kind of results will be produced by China's efforts to increase its international presence. However, what may complicate the issue is that the current situation, which is said to be a confrontation between the United States and China, affects the values of both sides, and, if any kind of evaluation is to be conducted, analysis and

evaluation from this aspect should be added as necessary. In any case, it is important to continue to understand China's international presence in science and technology activities, using the facts summarized in this report as a starting point.

It also goes without saying that Japan, whose research capabilities are said to be declining, should actively develop its international science and technology activities.

Reference 1: Basic Chinese documents related to this report

1. National Medium- and Long-term Program for Science and Technology Development (2006-2020)

http://www.gov.cn/gongbao/content/2006/content_240244.htm

Part VIII: Major Policies and Measures

Chapter 8: Expanding international and regional S&T cooperation and exchanges

The improvement of the nation's indigenous innovative capability calls for taking full advantage of the merits derived from opening to the outside world, and a significantly higher level of international and regional S&T cooperation and exchanges in various forms.

- Encouraging research institutes and universities to establish joint laboratories or R&D centers with overseas research institutes
- Support the implementation of international cooperation projects under bilateral or multilateral S&T cooperation frameworks
- Participate actively in large international scientific projects and international academic organizations
- Supporting Chinese scientists and research institutes to be part of or take the lead in large international and regional scientific projects
- Encourage multinational corporations to establish their R&D centers in China
- Offer favorable conditions for making China the physical location of international academic organizations or their regional offices

2-1. National 13th Five-Year Plan for S&T Innovation (2016-2020)

http://www.gov.cn/zhengce/content/2016-08/08/content_5098072.htm

Chapter 13: Building a "Belt and Road" Collaborative Innovation Community

1. Foster In-Depth Science and Technology Communication and Cultural Exchange

2. Strengthen the Construction of Joint R&D and Technology Transfer Centers

3. Promote the Connectivity of Science and Technology Infrastructure

4. Strengthen Cooperative Research with Countries Along the "Belt and Road"

Chapter 14: Comprehensive Integration and Deployment of Global Innovation Networks

- Deepen intergovernmental scientific and technological cooperation, classify and formulate country-specific strategies, enrich the scientific and technological content of new great power relationships, promote the establishment of innovative strategic partnerships with developed countries in science and technology, build an innovative community of mutual benefit
- Cooperate with neighboring countries, and extend the framework of the Science and Technology Partnership Program for Developing Countries
- Strengthen scientific and technological cooperation with Africa, Latin America, and other regions. Scale up scientific and technological assistance, pursue innovative assistance methods, and help developing countries strengthen scientific and technological innovation capacity building

4. Fully Participate in Global Innovation Governance

Actively participate in the formulation of major international scientific and technological cooperation rules, focus on major national concerns and global challenges, create public products for international scientific and technological cooperation, accelerate the sharing of large-scale scientific research infrastructure around the world, proactively set the global agenda

2-2. 13th Five-Year Development Plan of the National Natural Science Fund

https://www.nsfc.gov.cn/nsfc/cen/bzgh_135/09.html

Part 3: Development Mission

Chapter 9: Developing International Cooperation

(14) Deepening open cooperation and promoting a new type of internationalization

- Actively promote the development of international science and technology cooperation among national universities, research institutes, and institutions
- Provide opportunities for international cooperative research and training to Chinese students and young researchers, and develop a global perspective and the ability to participate in global science and technology activities
- Realize a shift from simple research project cooperation to a "project/human resources base" cooperation method
- Strengthen support for basic research cooperation amongst countries along the Belt and Road
- Support Chinese scientists in conducting research activities utilizing international large-scale scientific equipment and have them participate in major international scientific projects
- Encourage Chinese scientists to launch major international cooperative research projects and to work together to respond to major scientific challenges that are of common interest to humanity
- Strengthen cooperation with important international scientific institutions, participate in agenda-setting and decision-making at international scientific institutions, and support scientists who take on leadership roles at important international scientific institutions
- Establish offices in scientific and technologically advanced countries, strengthen cooperation and exchanges with relevant institutions abroad, and seek to promote improvements in the level of scientific funds management by referring to international advanced experiences

2-3. Outline of the Chinese Academy of Sciences 13th Five-Year Development Plan

https://www.hf.cas.cn/zcbm/fwzx/gzzd/zcfg/202007/W020200724339453664641.pdf

3. International Collaboration and Opening Up to the Outside

(1) Strengthen Cooperation with First-Class Institutions in Developed Countries and Form a Scientific Research Institution Cooperation Network

- With first-class scientific research institutions, research universities, innovative enterprises, and international S&T organizations both domestically and overseas we will jointly establish new scientific research support mechanisms
- We will start the establishment of offices outside of mainland China at the appropriate times, steadily expand the international cooperation network of CAS, and enhance the international influence of CAS

(2) Focus on the National BRI Strategy and Accelerate the Pace of "Going Global" in Science and Education

- We will start the implementation of the BRI international S&T cooperation program, build the BRI international scientist alliance and information network platform, fulfill the important role of CAS in China's S&T foreign aid, and promote the common prosperity and sustainable development of China and the BRI countries and regions.

(3) Participate in Global S&T Governance, Lead the Initiation of International S&T Programs, and Deeply Participate in Global Science and Technology Governance

- We will support scientists as they serve in international scientific organizations and further expand their numbers and influence.

Reference 2: The China Index (China's academic influence)

The China Index[206] is composed of data collected by Doublethink Lab from March 2021 to March 2022 in 82 countries. Doublethink Lab is an organization that studies the negative effects of digital authoritarianism, measuring and then publishing Chinese influence across nine domains: academia, domestic politics, economy, foreign policy, law enforcement, media, military, society, and technology.

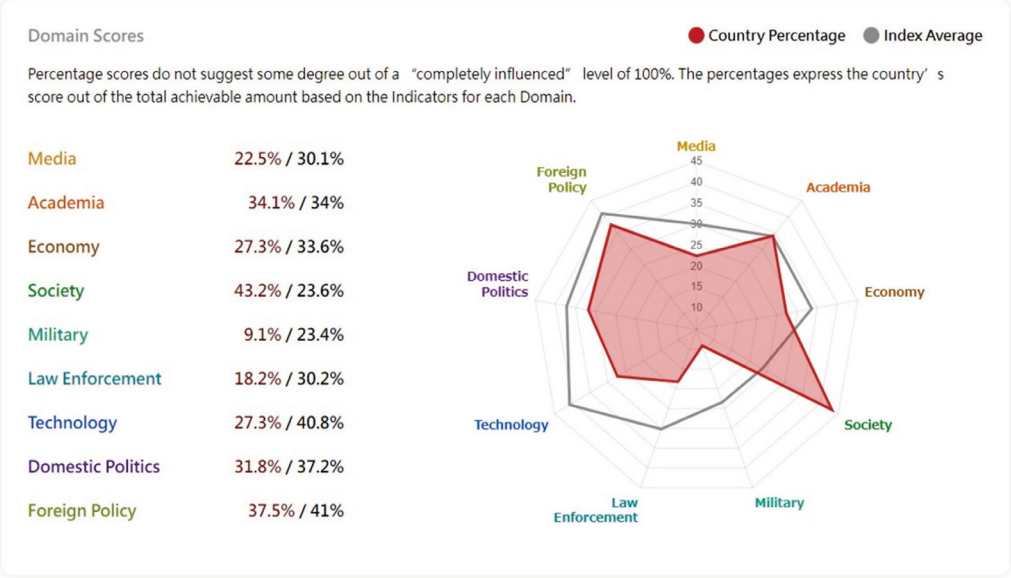
The numbers in parenthesis at the end of each item below indicate, out of the countries surveyed, the number of countries that responded that they are affected in that item.

1. In my country, universities have established research partnerships with PRC-connected entities. (73/82)
2. In my country, there are Confucius Institutes/Classrooms. (77/82)
3. My country plans to include, or does include, Chinese as a foreign language in K12 or primary education, and receives free or subsidized (e.g. offered below market price) educational books and teachers from PRC. (35/81)
4. In my country, one or more think tanks and academic research centers belong to PRC-affiliated networks/associations (such as: the Silk Road Think Tank Association, Silk Road Think Tank Network [SiLKS], Belt and Road Studies Network, University Alliance of the Silk Road, University Consortium of the 21st Century Maritime Silk Road). (40/80)
5. In my country, think tanks and academic research centers have received financial support from PRC-connected individuals or entities. (51/72)
6. In my country, experts participate in PRC talent recruitment programs such as the Thousand Talents Program or Changjiang Scholars program. (32/79)
7. In my country, scholars have taken trips to the PRC paid for by PRC-connected individuals or entities. (52/69)
8. In my country, organized PRC-connected student groups, such as Chinese Students and Scholars Associations (CSSAs), are involved in attempts to censor staff or students (e.g. by harassing students protesting human rights abuses in the PRC (17/81)
9. In my country, scholars or academics have been denied visas to travel to the PRC after expressing opinions or producing scholarship that is critical of the PRC. (11/75)
10. In my country, PRC-connected entities have been involved in school or university curriculum design, such as courses about East Asian history, modern politics, etc. (16/80)
11. In my country, there are confirmed reports of teachers or professors avoiding the discussion of sensitive political issues (e.g. Uyghur re-education camps, Taiwan independence, Tiananmen Square Massacre). (12/77)

206 China Index: https://china-index.io/

12. In my country, there are media organizations that belong to the World Chinese Media network. (38/80)
13. In my country, there are journalists or media organizations which are members of the Belt and Road Media Cooperation Alliance/Union, the Belt and Road News Alliance, or other Belt and Road media networks that connected to the PRC. (42/81)
14. In my country, there are journalists, media organizations or online influencers who have attended all-expenses paid media tours in PRC. (56/71)
15. In my country, there are journalists, media organizations or online influencers who have received trainings from PRC state-owned media or PRC-connected entities. (42/79)
16. In my country, there are PRC-connected professional associations that are closely engaged with their counterparts locally, such as All-China Journalists Association, China Artists Association, or China Writers Association. (47/80)

The scores for Japan are shown below. Note that the percentages do not mean a rating out of a possible "totally influenced" score of 100%, but instead are simply a ratio of the total possible score to the achieved score in that domain.



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