

## Analysis of Key Bottlenecks in Building an International Research Environment and Policy Recommendations: Postprint

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### Abstract

Strengthening the construction of an internationalized scientific research environment facilitates the promotion of international scientific and technological exchange and cooperation, and fosters the development of an open innovation ecosystem with global competitiveness. Based on survey research, interviews, and policy analysis, this article examines the bottlenecks in six key areas in China: researchers traveling abroad (including to Hong Kong, Macao, and Taiwan), cross-border flow of scientific data, entry and exit of research materials, opening up of science and technology programs, international science and technology organizations coming to China, and service guarantees for foreign talent, and subsequently proposes policy recommendations. The study reveals that China's efforts in building an internationalized scientific research environment are hampered by issues such as insufficient openness of the scientific and technological innovation system and gaps in supporting policies, which impede the smooth cross-border flow of innovation resources and affect the effective aggregation of global innovation resources. The root causes of these problems stem from both systemic deficiencies inherent in the policies and institutional frameworks themselves, and from inadequate implementation following policy promulgation, low awareness, and cumbersome procedural requirements. It is recommended that measures be taken to strengthen top-level design, improve laws and regulations, enhance inter-departmental coordination, optimize policy provisions, simplify procedures and formalities, and provide detailed operational guidance to remove bottlenecks in the cross-border flow of personnel, data, materials, and funds, thereby constructing a more competitive institutional environment for open cooperation in scientific and technological innovation.

## Full Text

### Bottleneck Analysis and Policy Suggestion on Construction of International Scientific Research Environment

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## Abstract

Strengthening the construction of an international scientific research environment is essential for promoting international scientific and technological exchanges and cooperation, as well as for building an open innovation ecosystem with global competitiveness. Based on research interviews and policy analysis, this article examines the bottlenecks in six critical areas: entry and exit of scientific research personnel, cross-border flow of scientific data, cross-border flow of research materials, openness of science and technology (S&T) plans, settlement of international S&T organizations, and services and welfare for foreign talents. The study reveals that China's international scientific research environment construction suffers from insufficient openness of the innovation system and gaps in supporting policies, resulting in obstructed cross-border flow of innovation resources and hindering the effective aggregation of global innovation resources. The root causes of these problems lie not only in systemic deficiencies within policies and institutions themselves, but also in inadequate policy implementation, low awareness, and cumbersome procedures. It is recommended to strengthen top-level design, improve laws and regulations, enhance inter-departmental coordination, optimize policy provisions, simplify procedures and formalities, and refine operational guidance to remove barriers to cross-border flow of personnel, data, materials, and capital, thereby building a more competitive institutional environment for open S&T cooperation.

**Keywords:** international scientific research environment, international scientific and technological cooperation, policy bottleneck, cross-border innovation resources

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## Introduction

The ongoing new round of scientific and technological revolution and industrial transformation, coupled with increasingly complex international situations and

intensifying great power competition, demands that China's innovation entities strengthen open cooperation in S&T innovation to address global scientific challenges and confront common human challenges [1]. Both the pressure of international competition and the intrinsic needs of S&T development require enhanced efforts in this domain. Since the 18th National Congress of the Communist Party of China, the Party Central Committee with Comrade Xi Jinping at its core has attached great importance to open cooperation in S&T innovation, making comprehensive deployments around expanding high-level opening up and building a new development pattern [2]. The report of the 20th Party Congress explicitly states, "Expand international S&T exchanges and cooperation, strengthen the construction of an international scientific research environment, and form an open innovation ecosystem with global competitiveness," providing clear direction for creating a better policy environment for S&T innovation and cooperation in the new era.

Currently, China ranks 12th in the global innovation capacity index, with 19 cities (regions) entering the list of top 100 global international S&T innovation centers, where innovation environment and ecosystem serve as important indicators. Broadly defined, an international scientific research environment encompasses the overall environment related to international S&T cooperation, including "hard environment" such as research platforms and infrastructure, as well as "soft environment" comprising policy systems, social integration, and life facilitation. Strengthening the construction of an international scientific research environment has become crucial for improving China's overall internationalization level, promoting two-way flow of innovation elements, and enhancing national and regional innovation capacity. However, China's current international scientific research environment remains constrained by insufficient openness of the innovation system, obstructed cross-border flow of innovation elements, and incomplete supporting policies [3], necessitating urgent optimization and adjustment according to domestic and international situation changes and practical needs.

Numerous scholars have conducted research on China's international scientific research environment construction. Regarding its connotation, the environment includes both internal and external dimensions: internally, it involves strengthening international research platform construction, aligning technical standards, S&T laws, and intellectual property protection with international norms, and facilitating entry and exit policies; externally, it includes providing convenient services for foreign talents in research and daily life, and opening up national S&T plans, preferential policies, and knowledge systems [4,5]. Concerning existing bottlenecks, scholars argue that China's overall openness in S&T remains insufficient, with specific policies on opening S&T plans and foreign scientists' participation in cooperation yet to be effectively implemented, constraining the initiative to deepen international S&T cooperation [6,7]. The model for introducing foreign talents focuses primarily on financial incentives while paying insufficient attention to the "soft environment" for innovation, entrepreneurship, and daily life [8]. Issues also exist in cross-border data flow [9], approval

and supervision of biological material imports [10], cross-border use of fiscal research funds [11], and attracting international organizations [12]. Regarding improvement suggestions, scholars propose strengthening institutional guarantees and environmental construction [2], expanding openness of S&T plans [7], promoting two-way cross-border flow of innovation elements, creating a more open environment for international talent development [13], and continuing to optimize facilitation measures for international talents in research, work, residence, and entry/exit [2]. Overall, existing research on international scientific research environment is scattered across discussions on open innovation, international S&T cooperation, and cross-border flow of innovation elements, lacking systematic 梳理, targeted analysis, and solutions for policy bottlenecks urgently needing resolution under the new situation.

Based on our research group' s experience in formulating national-level open innovation plans and policy documents, and in close conjunction with the urgent needs of various innovation entities for S&T cooperation after the COVID-19 pandemic, this study analyzed over 100 laws, regulations, and policy documents and conducted more than 200 interviews and discussions. It deeply examines the persistent bottlenecks and challenges in China' s international scientific research environment construction and proposes policy recommendations for accelerating its optimization under the new situation.

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## 1. Research Design and Implementation Methods

### 1.1 Specific Contents of International Scientific Research Environment Construction

This study focuses on the “soft environment” construction of international scientific research environments. By examining national-level and local S&T innovation plans from Beijing, Shanghai, Guangdong, and other regions , we have identified three main components. First is the policy environment for promoting S&T openness and cooperation, covering openness of S&T plans, cross-border flow of innovation elements such as talent, data, materials, and capital, policies for attracting international S&T organizations and foreign R&D centers, which serve as effective pathways for optimal matching of innovation knowledge, technology, and economic development, significantly promoting innovation performance [14]. Second is the institutional environment conducive to attracting and gathering international S&T talent, including “introduction” policies represented by talent programs, “access” policies represented by entry/exit and work permits, “welfare” policies concerning daily life, and “development” policies focusing on research work and career advancement for introduced high-end foreign talent. Third is the innovation and entrepreneurship service environment aligned with international norms, including providing financing channels and tax reduction policies for domestic and foreign technology enterprises, expanding cross-border financial services, and policies promoting entrepreneurship

incubation and technology transfer, as well as technical standards, S&T laws, and intellectual property protection policies that align with international practices.

## 1.2 Research Methods

Construction of an international scientific research environment is an extremely comprehensive and complex issue involving numerous departments, with different understandings and needs across domestic and international contexts, eastern and western regions of China, and various levels of researchers and managers. Focusing on key issues and deeply investigating the causes of bottlenecks, this study provides policy recommendations based on comprehensive judgment. To leverage the important role of S&T evaluation in identifying bottlenecks, analyzing causes, and solving problems, this study adopts a problem-oriented approach, combining field research, discussions, case studies, and policy analysis. Specific methods include: (1) Discussions, interviews, and field research. Between 2019 and 2023, we conducted 14 discussion sessions and 15 field visits in Beijing, Shanghai, the Guangdong-Hong Kong-Macao Greater Bay Area, and other regions with active international S&T cooperation such as Hangzhou, Ningbo, Xi'an, and Chengdu, covering over 160 units including strategic experts, local S&T authorities, university and research institute administrators, domestic researchers, and foreign talents. (2) Case studies. We selected topics considered most urgent by researchers, including personnel entry/exit, scientific data cross-border flow, research materials entry/exit, S&T plan openness, and international S&T organizations in China, conducting tracking studies on 1-2 typical institutions for each topic to analyze difficulties encountered during policy implementation. (3) Policy analysis. We collected and studied over 100 publicly available laws, regulations, policy documents, reports, and literature from official websites of national and local organizations, S&T, finance, foreign affairs, cyberspace, industry, health, customs, and foreign exchange departments, as well as national law databases, to determine whether bottlenecks stemmed from policies themselves or implementation issues, providing basis for subsequent policy recommendations.

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## 2. Bottleneck Analysis in International Scientific Research Environment Construction

### 2.1 Specific Problem Analysis

This article selects six of the most urgent issues for detailed analysis.

**(1) Inadequate Implementation of Official Overseas Travel Policies for Teaching and Research Personnel.** Cross-border personnel exchange is fundamental to international S&T innovation cooperation, and the convenience of entry and exit directly affects whether teaching and research personnel can

smoothly conduct international cooperation [15]. While China has issued policies such as the “Guiding Opinions on Strengthening and Improving the Management of Teaching and Research Personnel’s Temporary Official Overseas Travel” to simplify procedures, numerous difficulties persist in implementation. First, rigid management approaches exist in some localities, with phenomena of “inadequate policy understanding, reluctance to approve, and unwillingness to delegate power,” adopting “one-size-fits-all” management for group size and duration abroad. Some local universities and research institutes still have their foreign affairs approval authority centralized under local foreign affairs departments, strictly controlling what is considered general visits [16]. Second, policies need refinement and clarification, as special cases such as traveling with private passports or foreign researchers’ official overseas travel for academic exchanges generally lack policy basis. Third, approval processes remain cumbersome, with excessive internal review stages in some universities and research institutes with foreign affairs approval authority, affecting efficiency.

### **(2) Obstructed Access to Scientific Data and Information Resources.**

Scientific data constitutes an important branch of big data. Since 2017, with the gradual enactment of the Cybersecurity Law, Data Security Law, and Personal Information Protection Law (collectively the “Three Data Laws” ), China has established a governance system for cross-border data flow supported by measures such as the Data Cross-Border Transfer Security Assessment Measures and Personal Information Cross-Border Transfer Standard Contract Measures. However, this governance system remains imperfect, with unclear supervision rules and opaque management methods. First, top-level design for scientific data cross-border governance is insufficient, requiring clearer concepts and approaches. Post the “Three Data Laws,” the principle of “openness as the norm, non-openness as the exception” needs adjustment, while security risks may exist in already opened scientific data. Second, the governance system remains incomplete, with management measures for data classification and grading in S&T fields, catalogs of important data, and identification rules for critical information infrastructure still absent, causing researchers to be uncertain about data export security management boundaries [17] and “dare not” let data flow abroad. Third, infrastructure and management service levels for scientific data cross-border flow need improvement. The internationalization level of scientific data centers requires enhancement to better support global research, while insufficient supply of global public goods for scientific data storage associated with publications intensifies the risk of scientific data sovereignty loss.

### **(3) Difficulties in Cross-Border Flow of Research Instruments, Samples, and Other Materials, with Mismatched Taxation and Management Policies.**

First, tax exemption issues arise as “non-whole-set” research equipment not covered by intergovernmental cooperation agreements cannot obtain import/export tax exemptions for scientific cooperation and teaching supplies. Second, temporary import/export problems exist, as research instruments must be re-exported or re-imported within six months, with a maximum tax-free period not exceeding two years, which fails to meet actual needs for overseas

experiments and continuous observations. Third, importing used equipment poses challenges, as depreciation levels are difficult to assess, leading some used equipment to be classified as new and subject to high taxes, while some used research equipment is mistakenly identified as “foreign garbage” and denied entry. Fourth, transit and cooperative use of human genetic resources require strengthened popularization and guidance of the Implementation Rules for the Human Genetic Resources Management Regulations, as some grassroots units have not timely established management departments or formulated relevant systems, and researchers’ legal awareness needs continuous strengthening, leading to inadequate application materials and repeated supplementary submissions.

**(4) Low Openness of S&T Plans and Imperfect Tax and Foreign Exchange Management Systems for Cross-Border Use of Research Funds.**

First, overseas research institutions cannot directly undertake China’s fiscal S&T plan projects. Currently, only the National Key R&D Program, National Natural Science Foundation, and Guangdong and Shenzhen fiscal S&T plans are open to Hong Kong and Macao research institutions, while other plans generally do not allow scientists working overseas (including Hong Kong and Macao) to apply based on overseas institutions. Second, the internationalization level of S&T plan management needs improvement, as most project (fund) application guidelines, proposals, and annual reports are in Chinese only, with international review and joint review mechanisms still in early exploration, making it difficult for foreign scientists in China to apply. Third, foreign-related funds expended through service purchase arrangements in S&T projects are “manageable but not operable.” While cross-border research funds can be processed as “trade in services,” they are still considered general business activities without differential treatment for research activities, and research (financial) management departments, banks, and tax authorities have different interpretations, leading to inadequate policy popularization and complex procedures.

**(5) Obstacles for Overseas Non-Governmental S&T Organizations’ Activities and Settlement in China, with Challenges in Initiating International S&T Organizations.**

The Law of the People’s Republic of China on Administration of Activities of Overseas Non-Governmental Organizations in Mainland China provides specific regulations, yet the current policy environment is insufficient to attract world-class, influential non-governmental international S&T organizations to settle in China [11]. First, the institutional system for initiating, attracting, or participating in international S&T organizations needs improvement, lacking laws and implementation 细则 for their settlement and development [18], with phenomena of using administrative methods for academic organizations and domestic approaches for overseas organizations. Second, registration and filing procedures are cumbersome, involving multiple departments including civil affairs, public security, science and technology associations, and business guidance units [19], not yet fully aligned with international rules. Third, the management and service system for international S&T organization affairs needs improvement, with unclear administrative 归属, inadequate inter-departmental coordination mechanisms, and unclear classification



of overseas non-governmental organizations.

**(6) Foreign Talent Services and Welfare Require Optimization in Top-Level Design, Institutional Improvement, Convenience, and Research Integration.** Since the 18th Party Congress, China has issued numerous laws, regulations, and policy measures covering visas, work permits, residence and permanent residence, social insurance, medical care, individual income tax, children's education, spouse employment, finance, and entrepreneurship for foreign talents, forming an important institutional environment. However, further optimization is needed. First, the legal system is incomplete, with insufficient top-level design and coordination. Laws and regulations for foreigners working in China, permanent residence, and skilled migration remain unissued, with legislative gaps and unclear standards and procedures [20], while service functions are dispersed across multiple departments without full policy synergy. Second, some policies have narrow beneficiary coverage. While policies for high-end or top foreign talents are relatively complete, services for general foreign talents are inadequate, with difficulties in achieving "national treatment" in children's education, foreign exchange purchase and payment, and housing provident funds, and the classification standards for foreign work permits need optimization. Foreigners' social insurance contributions often fail to meet the 15-year requirement and cannot be extended or paid in lump sums. Third, policy convenience needs improvement, with insufficient publicity and awareness. China lacks a unified foreigner identity document, and permanent residence certificates have not achieved convenience in daily life details. The trust and fund chains in domestic mobile payments need improvement, with difficulties for foreign talents in applying for and using credit cards. Policy publicity is insufficient for entry/exit, social insurance, children's education, and foreign exchange purchase, creating "last-mile" blockages. Fourth, overseas high-level talents, especially foreign talents, face difficulties in applying for S&T projects after arriving in China, with the domestic talent evaluation mechanism focusing excessively on "hats" and quantitative indicators like projects and publications, creating significant pressure for overseas high-level talents, particularly young talents in their "climbing period."

## 2.2 Systemic Problem Analysis

Building an international scientific research environment is a systematic project involving multiple dimensions, actors, and links. The causes of these bottlenecks include both external environmental and international situation impacts, as well as issues with governance capacity and level, policy coordination, and implementation, requiring examination from higher levels and deeper perspectives.

**(1) The Complex International Situation is the Major External Variable Delaying China's Construction of an International Scientific Research Environment.** The current severe and complex international situation, with various risks and challenges emerging in succession, means that great power



relations and geopolitics will remain important factors affecting China's international S&T cooperation and diplomacy for a long time. Particularly, as the United States views China as its primary strategic competitor, continuously implementing S&T and industrial containment and rallying allies to besiege China's S&T development, a "chilling effect" has been created for other countries cooperating with China, hindering international S&T cooperation and the attraction of overseas talents. International cooperation paper data shows that China's international S&T cooperation activity index declined from 27.4% in 2018 to 25.0% in 2021, with China-U.S. cooperation dropping nearly 10 percentage points compared to 2018. The 2023 China Business Report by the American Chamber of Commerce in Shanghai shows that 66% of American companies consider "increasingly tense China-U.S. relations" the top business challenge for three consecutive years, particularly in technology and R&D sectors.

**(2) The Modern Governance System and Capacity Have Not Fully Adapted to the New Requirements of Coordinating Opening Up, Development, and Security Under the New Situation.** As scientific research paradigms undergo profound transformation, S&T has increasingly significant impacts on society and human development, placing higher demands on the modernization of China's governance system. Taking scientific data as an example, with the rise of data-intensive fourth research paradigms, scientific data has become a strategic and foundational resource with the fastest dissemination speed, widest impact, and greatest development potential. However, compared with Europe and the United States, China's scientific data cross-border flow governance system remains in its infancy, with many rules and institutions still absent, making it difficult to maximize data openness and sharing while ensuring data security. Similar challenges exist in other areas of opening up: only with effective control can opening be achieved, and effective control requires scientific, precise, and standardized governance systems.

**(3) Insufficient Top-Level Design and Coordination Around International Scientific Research Environment Construction.** First, functions are dispersed. Relevant functions for international scientific research environment construction are scattered across multiple departments including S&T, immigration, foreign affairs, human resources, finance, public security, customs, taxation, medical insurance, education, and foreign exchange, with different development stages and resource endowments across regions, making policy coordination difficult at inter-departmental, central-local, and inter-regional levels, hindering holistic efforts to create an open innovation environment. Second, cost-benefit considerations affect policy formulation and implementation. Foreign talent service and welfare policies involve social insurance, medical care, children's education, and foreign exchange—livelihood affairs that generally cannot distinguish between foreigners and Chinese, making it difficult to allocate public resources to the absolutely minority of foreign talents. Third, inconsistent systems exist. Various service and welfare policies exist primarily as departmental regulations, numerous in quantity but lacking consistency and coherence, failing to effectively meet diverse talent needs.

**(4) Difficulties in Policy Implementation, with “No Policy Barriers but Operational Obstacles.”** Since the 18th Party Congress, China has issued numerous central-level policies to improve the international scientific research environment, yet long-standing difficulties, bottlenecks, and pain points persist. First, at the central level, laws, regulations, and policy documents on scientific data cross-border management and international S&T organization settlement are primarily principled guidance, lacking research on specific implementation mechanisms and detailed rules. Second, at the local level, inadequate publicity and interpretation of policies on official overseas travel for researchers, foreign permanent residence certificates, and foreign exchange purchase lead to phenomena of “inaction,” “excessive implementation,” or “implementing documents with documents” during actual implementation. Third, at the institutional and beneficiary levels, issues exist such as inadequate service awareness, insufficient policy understanding, rigid management approaches, and reluctance to assume responsibility regarding human genetic resources management, research fund cross-border transfer through “service purchase,” and foreign talents’ entitled benefits in individual income tax, children’s education, social insurance, and medical care. Additionally, most policy documents are communicated internally, with grassroots management departments and research institutions unaware of their existence. Furthermore, long-standing problems of “emphasizing activities over effects and weak evaluation” exist in policy implementation.

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### 3. Policy Recommendations for Optimizing the International Scientific Research Environment

Under the new situation, China should adopt more open thinking and measures to strengthen international S&T exchanges and cooperation, improve policy supply for open S&T innovation, continuously optimize and refine international S&T cooperation service policies, focus on removing practical bottlenecks in building and optimizing the international scientific research environment, and fully stimulate the vitality and motivation of all innovation entities to engage in international S&T exchanges and cooperation.

**(1) Strengthen Top-Level Design and Coordination.** Give full play to the coordinating role of the Central S&T Commission in addressing strategic, directional, and overall issues in international scientific research environment construction, further improving policy systematicness and foresight. Accelerate improvement of legal systems for skilled migration, talent visas, permanent residence, and work regulations for foreigners. Enhance inter-departmental coordination to strengthen synergistic effects in policy implementation. Improve inter-departmental information sharing, back-end authentication, and business coordination. Strengthen central-local linkages, promptly guide localities to remove bottlenecks and difficulties for “no policy barriers but operational obstacles” issues, and promote effective policy implementation. Establish institutional research and information reporting systems, conduct planned investi-

gations, strengthen connections with domestic innovation entities and foreign talents, and smooth channels for reflecting appeals from research units and personnel, focusing on policy effectiveness evaluation and enhancing sense of gain.

**(2) Further Optimize Entry and Exit Management for Teaching and Research Personnel.** First, delegate approval authority. Further refine policies on teaching and research personnel' s temporary official overseas travel for academic exchanges, comprehensively delegating foreign affairs approval authority to creditworthy universities and research institutes with frequent international S&T exchanges to facilitate international exchanges. Second, optimize foreign affairs fund management. Strengthen coordination among teaching, research, finance, and audit departments to further optimize foreign affairs plan management and fund reimbursement processes, enhancing support for special groups (tasks) such as participation in international organization activities and major international scientific programs (projects). Encourage teaching and research personnel from universities, research institutes, and medical institutions to use private passports for overseas academic activities when necessary to achieve project objectives, strengthening coordinated support for reimbursement and audit after mission completion. Third, explore new entry/exit management models. Explore new convenient entry models such as "one location, two inspections" for qualified personnel in suitable regions, using intelligent technologies to provide convenient customs clearance services for eligible researchers.

**(3) Guide Orderly and Efficient Access to Global Scientific Information Resources.** First, accelerate formulation of detailed rules for scientific data cross-border flow management. Clarify the basic approach to scientific data cross-border flow, finding the balance between open sharing and data protection [21]. Develop guidance catalogs for important data in S&T fields, accelerating implementation of scientific data classification and compliance review for cross-border flow. Second, strengthen standardized data management and legal publicity. Improve the internationalization and data management level of existing scientific data centers and research institutions, strengthen standardized data management, and enhance legal publicity for data owners to promote rational data flow under security premises. Third, conduct pilot programs for scientific data cross-border flow. Support the Guangdong-Hong Kong-Macao Greater Bay Area, Hainan Free Trade Port, and various free trade zones in exploring "white list" and direct data cross-border reporting mechanisms during implementation of data export security assessment, personal information protection certification, and standard contract filing systems, providing experimental demonstration for nationwide promotion. Fourth, strengthen international governance cooperation on scientific data. Enhance research and international cooperation on scientific data cross-border flow and open sharing, actively participate in global governance of scientific data cross-border flow, and promote international cooperation and open sharing of scientific data.

**(4) Continuously Promote Convenient Cross-Border Flow and Trusted Supervision of Various Research Samples and Materials.**

First, simplify procedures. Strengthen coordination among S&T, customs, and taxation departments to study and simplify customs clearance procedures for important research materials. Second, improve tax exemption regulations. Expand the scope of tax preferential policies for research material imports during the “14th Five-Year Plan” period to further cover “non-whole-set” equipment, samples, and specimens, extend and relax time limits and frequency requirements for temporary import/export tax exemption, and ensure tax exemption needs for research materials required by major international scientific programs (projects) and important international S&T cooperation projects. Third, establish “green channels.” Explore establishing “white lists” for research instruments, samples, reagents, and consumables, adopting pre-commitment declaration and rapid customs clearance through “green channels.” Fourth, conduct pilot programs in specific regions. In specific regions such as the Guangdong-Hong Kong-Macao Greater Bay Area and Hainan Free Trade Port, explore convenient tax reduction and exemption pathways for overseas equipment (including new and used equipment) and various research materials used by local research institutions and enterprises, allowing mobility within specific scopes and gradually expanding. Fifth, strengthen policy publicity and popularization for human genetic resources transit and use. Promote management departments to enhance interpretation of the Implementation Rules for Human Genetic Resources Management Regulations and related application and approval documents. Encourage grassroots research management units to establish specialized human genetic resources management departments and formulate implementation 细则, supervising the implementation of higher-level documents.

**(5) Increase Openness of S&T Plans and Attract Scientists from Various Countries into China’ s Research System.** First, pilot support for foreign scientists to directly undertake China’ s S&T plans. Relying on the “Global Scientific Research Fund,” solicit major research tasks globally, allowing overseas institutions to directly apply for and undertake project tasks. Select suitable S&T plans (funds, projects) as pilots, allowing overseas research institutions to participate as cooperative units in joint applications with domestic units and providing fiscal funding support. Second, further promote implementation and internationalized management of international S&T cooperation projects. Encourage China’ s research funding departments and various innovation entities to jointly establish research funds or co-funding programs with foreign counterparts, gradually implementing “two teams, one proposal, common objectives” joint application and international review mechanisms [22]. Promote bilingual (Chinese-English) versions of international cooperation project application guidelines, proposals, task books, interim reports, and acceptance reports to provide more convenience for foreign scientists applying for projects. Third, facilitate cross-border allocation and use of research funds [23]. Establish green channels for overseas allocation of research funds, improving intelligence and convenience in foreign exchange payment and tax payment for research purposes. Strengthen coordination among S&T, taxation, foreign exchange, and

banking departments to further refine management of non-profit foreign-related research businesses (such as cross-border remittances and tax exemption).

**(6) Actively Attract International S&T Organizations to Settle in China.** First, improve institutional construction. Accelerate issuance of detailed rules for registration of international S&T organizations in China, clarifying priority registration fields. Optimize policies for international organizations in banking, foreign exchange, taxation, legal protection, personnel employment, and foreign affairs management. Clarify management 归属 and responsibilities for international S&T organization settlement, constructing long-term working mechanisms with relevant departments taking the lead, civil affairs departments handling registration, and all departments performing their duties [24]. Second, increase attraction efforts. Fully utilize regional innovation highlands and opening advantages to guide the establishment of various international S&T organizations in Beijing, Shanghai, and the Guangdong-Hong Kong-Macao Greater Bay Area, which have good international exchange environments and S&T talent foundations. Third, optimize support policies. Learn from international experience by providing rent concessions and operational subsidies for international S&T organizations to ensure financial support for their S&T exchange activities. Additionally, strengthen cultivation of Chinese personnel holding positions and potential candidates in international S&T organizations, promoting Chinese scientists' high-level participation in decision-making and management of international S&T organizations.

**(7) Create an Internationally Competitive and Attractive Talent Development Environment.** First, provide service and welfare policies aligned with international standards for all types of domestic and foreign talents. Develop more flexible pension insurance contribution and extension policies, strengthen housing support for foreign talents, lower thresholds and improve convenience for foreign talents to apply for credit cards, strengthen construction of internationalized designated hospitals, promote effective implementation of inclusive policies for foreign talent children to attend public schools, and encourage localities to promote internationalization of basic education resources. Second, create a livable and internationalized environment to enhance overseas S&T talents' sense of belonging. Break information barriers in transportation, mobile payments, healthcare, and other life scenarios, smooth diversified payment mechanisms including RMB cash, credit cards, electronic wallets, WeChat Pay, and Alipay, and expand application scope of foreign passports and permanent residence certificates in various life scenarios. Continuously optimize international language environments and guide localities to meet housing needs of different types of overseas talents. Increase policy publicity for all types of international talents to ensure comprehensive awareness and direct access; publicize exemplary deeds of outstanding overseas S&T talents to create a favorable social atmosphere for attracting, utilizing, and retaining talents. Third, accelerate improvement of the "soft environment" for international talents' research and work to promote better integration into the research and innovation ecosystem. Take multiple measures to strengthen support

for international talents, especially young talents, accelerate internationalized management of S&T plans (projects, funds), and introduce international peers for guideline formulation and project review. Effectively address drawbacks of the “hat” culture and guide the formation of scientific and rational talent evaluation orientation, creating a clean, upright, and internationally vibrant talent work and development environment.

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## 4. Conclusion

The international scientific research environment is an important component in building an open innovation ecosystem with global competitiveness, crucial for advancing international S&T innovation centers, creating regional innovation highlands, and achieving high-level S&T self-reliance. This article examines six aspects—research personnel entry/exit, scientific data cross-border flow, research materials entry/exit, S&T plan openness, international S&T organization settlement, and foreign talent services and welfare—to conduct in-depth analysis of the policy and institutional environment. The study finds that all six aspects suffer from policy implementation issues, leading to obstructed cross-border flow of innovation resources and affecting effective aggregation of global innovation resources. These problems stem from both external factors such as changes in the international situation and COVID-19, and internal factors related to the internationalization level of China’s research environment and basic capacity for open S&T innovation cooperation.

At the first meeting of the 20th Central Committee for Comprehensively Deepening Reform, General Secretary Xi Jinping emphasized that “comprehensively deepening reform should be the fundamental driving force for advancing Chinese-style modernization” and “strive to overcome more difficulties in breaking institutional and systemic drawbacks and adjusting deep-seated interest patterns,” providing clear direction for accelerating international scientific research environment construction. Meanwhile, the establishment of the Central S&T Commission will provide opportunities to systematically and fundamentally resolve bottlenecks in international scientific research environment construction. The six bottleneck issues discussed in this article represent only part of numerous institutional problems, but the approaches to solving them have broad significance. Looking forward, on one hand, we should strengthen open cooperation with various international innovation entities, actively voice “China’s perspective” in international S&T organizations, demonstrate China’s confidence and determination for open cooperation to the international community, and widely engage the international scientific community, global academic community, and governments in building China’s “international scientific research environment.” On the other hand, we should promote international scientific research environment construction at higher starting points, levels, and goals, strengthen top-level design and coordination, optimize policy provisions, resolve policy barriers, promote policy implementation, and drive institutional reforms with “nail-driving

spirit” to build a more competitive international S&T cooperation environment and more friendly talent service environment, contributing to high-level S&T self-reliance and benefiting all mankind.

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*Note: Figure translations are in progress. See original paper for figures.*

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