Cross-fertilization of Natural and Social Sciences: A Review of the International Science Council Postprint

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Abstract

The merger of the globally influential International Council for Science and International Social Science Council, and the subsequent establishment of a unified International Science Council, constitutes a milestone in the history of international scientific development, signifying that integrated research across natural and social sciences has become the prevailing trend in contemporary scientific advancement. The strategic positioning of the International Science Council is to serve as the global voice for all sciences, facilitating interdisciplinary and transregional research to address complex global challenges. Researchers in China should seize this opportunity to deepen interdisciplinary exchanges and cultivate interdisciplinary talent, expand integrated interdisciplinary research on global change and sustainable development, and make new contributions toward addressing China's major strategic needs and enhancing the international influence of Chinese scientific research.

Full Text

The Integration of Natural and Social Sciences: A Review of the International Science Council

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Abstract

The milestone merger of the International Council for Science (ICSU) and the International Social Science Council (ISSC), marking the establishment of a unified International Science Council, signifies that integrated research across natural and social sciences has become a defining trend in contemporary scientific development. This historic event will be recorded as a landmark in the annals of international science. The strategic positioning of the International Science Council is to serve as the global voice for all sciences, facilitating interdisciplinary and trans-regional research to address complex global problems. Chinese researchers should seize this opportunity to deepen interdisciplinary exchange and cultivate cross-disciplinary talent, expand integrated research on global change and sustainable development, and make new contributions toward addressing China' s major strategic needs while enhancing the nation' s international scientific influence.

Keywords: interdisciplinary research; International Council for Science; International Social Science Council; International Science Council

Global change and sustainable development represent critical challenges facing human society today. Throughout societal evolution, human activities have profoundly impacted the Earth system, triggering a cascade of global environmental and social problems that threaten human survival and development [1]. Science must urgently provide effective solutions to these complex global issues. With the advent of big data and digital Earth, both natural and social sciences are evolving toward new research paradigms, generating novel conceptual frameworks and methodological approaches [2]. Confronted with such intricate global problems, we can no longer rely on single disciplines or research groups working in isolation. Researchers increasingly seek to strengthen interdisciplinary collaboration and international cooperation, integrating knowledge and methods from across natural and social sciences to conduct comprehensive research on complex global challenges [3-4].

At a joint meeting held in Taipei, members of ICSU and ISSC cast a historic vote to approve their merger and formally establish a unified international organization in 2018. The newly created International Science Council consolidates the existing memberships of both organizations, comprising 40 international scientific unions and associations along with over 140 national and regional organizations.

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1. Background of the International Science Council' s Establishment

The International Council for Science (ICSU), headquartered in Paris, is one of the world' s oldest non-governmental organizations. It aims to promote international scientific activities across different natural science sectors and has served as one of the most important academic organizations, playing active

roles in numerous aspects of natural science. Through establishing interdisciplinary research programs and collaborating with other organizations, ICSU has explored solutions to global problems. Its past major research programs include the International Polar Year (2007-2008), International Geophysical Year (1957-1958), and International Biological Program (1964-1974). Current major programs include the International Geosphere-Biosphere Programme (IGBP), World Climate Research Programme (WCRP), and International Programme on Biodiversity (DIVERSITAS).

The International Social Science Council (ISSC), established in 1952, is a nonprofit international academic organization representing major global institutions in social sciences, including economics, sociology, and behavioral sciences. Also headquartered in the UNESCO building in Paris, ISSC aims to promote social science research and application worldwide, ensure their exchange and promotion at the international level, and help solve major global social problems by strengthening social and human sciences. Through its members and programs, ISSC has reached hundreds of thousands of social scientists working across diverse disciplines, studying social development conditions worldwide.

Since the 1990s, particularly following the establishment of the International Human Dimensions Programme on Global Environmental Change (IHDP), the two organizations have maintained close cooperation. Faced with complex global problems threatening human survival and development, interdisciplinary research between natural and social sciences gradually emerged as a new trend. To address major global scientific challenges, ICSU and ISSC jointly established the Earth System Science Partnership (ESSP) in 2001 by uniting four major programs, representing a systematic interdisciplinary approach to solving global issues. In 2012, together with the United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP), United Nations University (UNU), International Group of Funding Agencies for Global Climate Change (IGFA), and other international institutions, they launched the Future Earth initiative to further promote interdisciplinary research between natural and social sciences, providing guidance and pathways for achieving global sustainable development goals.

The influential ICSU and ISSC had already recognized by 2015 that international natural and social science institutions needed to accelerate their cooperative relationships, as no natural science problem could be addressed in decision-making without social science participation [7]. The chairs of both councils reached consensus through correspondence and established a joint working group to explore closer institutional links and merger possibilities. At the 2017 joint meeting in Taipei, council members voted overwhelmingly to merge. The new organization, the International Science Council, was formally established in 2018, automatically incorporating all former members of both organizations. This milestone event in the development of integrated natural and social sciences research will be recorded in history, marking a new revolution in contemporary science—the integration of natural and social sciences to solve major global issues

affecting human survival and development.

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2. Strategic Positioning and Core Concepts of the International Science Council

The International Science Council' s primary work is executed by two groups: the Transition Working Group and the Strategic Decision Group. The Transition Working Group, co-chaired by Alberto Martinelli (ISSC) and Gordon McBean (ICSU), is responsible for all substantive implementation tasks before the Council' s formal establishment, including proposing new statutes for the merged organization, recommending secretariat structures, and suggesting practical procedures and timelines for completing the merger. The Strategic Decision Group, co-chaired by Saths Cooper (ISSC) and Jinghai Li (ICSU), is responsible for development discussions, drafting strategic plans, and preparing governing charters for the International Science Council.

The strategic positioning of the International Science Council aims to establish it as the global voice for all science, with a vision of making science a global public good. The Council' s core development concepts include excellence, innovation, and multiple other dimensions.

2.1 Global Voice for Science The International Science Council' s strategic positioning is to become the global voice for all sciences. It will reflect on the importance of scientific research in the contemporary era, establish funds to encourage researchers to conduct comprehensive studies on major global issues, provide new platforms to disseminate research findings on global challenges to the public, and promote scientific rigor worldwide. The Council aims to demonstrate science' s vital significance for social life, promote continuous scientific research and extensive cooperation, and protect scientists' rights to practice science freely and responsibly.

2.2 Making Science a Global Public Good The International Science Council' s vision is to promote science as a global public good. Scientific knowledge is essential for human understanding of the world and creating the future, and should serve as the fundamental basis for social decision-making and public policy. As modern society confronts sustainable development, peace, and equality challenges on Earth, maintaining science as a global public good is crucial. Scientific data and research results should be oriented toward serving human needs. The International Science Council aims to build a mutually supportive global science alliance.

2.3 Core Value Concepts In fulfilling its responsibilities, the International Science Council will uphold the following values:

- **Excellence and Professionalism:** The Council will provide high-quality, professional research results to society, strictly ensuring that communicated information reflects the best contemporary scientific discoveries, including their uncertainties.
- **Inclusiveness and Diversity:** The Council will promote scientific development and value demonstration, incorporate perspectives and methods from around the world, and enhance the participation of women and young scientists in international scientific research.
- **Transparency and Integrity:** The Council' s governance and decision-making processes will be open and transparent by default, unless strict confidentiality is required. Individuals representing the Council must demonstrate complete and positive ethical standards, clearly articulate scientific understanding of objective phenomena, and reject all forms of discrimination.
- **Innovation and Sustainability:** The Council will attract new talents and ideas, embed sustainability principles into its policies and practices, encourage researchers to innovate methodological approaches, and propose novel solutions.

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3. Opportunities and Challenges

3.1 For the International Science Council The establishment of the International Science Council has seized the opportunities of contemporary scientific development. Founded at a critical moment of scientific transformation, the Council addresses an unprecedented need for a strong, credible voice to advocate for science' s value to society, particularly amid climate change and globalized socio-economic development. The UN' s 17 Sustainable Development Goals have revealed that sustainable and equitable living faces enormous challenges in today' s rapidly changing world.

Modern scientific and technological development enables research integration: (1) Internet cloud databases, digital Earth, and other modern technologies lay the foundation for comprehensive processing of natural and social data, while constantly evolving research methods provide possibilities for the Council to support integrated scientific development. (2) The complementarity between social and natural sciences offers tremendous potential for contemporary scientific development, enabling science to more effectively inform social decision-making. (3) The Council' s predecessors (ICSU and ISSC) possess significant advantages in global influence and recognition, with numerous international research programs and extensive cooperation providing a solid foundation.

However, challenges remain: enabling flexible operation of such a large membership organization will require substantial administrative coordination. Key challenges include developing comprehensive research theories, methods, and

technologies through scientific programs; further promoting international cooperation to deepen global issue research; and particularly for developing countries, listening to their authentic voices and responding to their expectations—critical for achieving regional equity in sustainable development.

3.2 For the Chinese Science Community Since the 1980s, China has emphasized interdisciplinary research development [8-9]. Interdisciplinary science is a comprehensive, cross-disciplinary product that solves major complex scientific, social, and global problems. China needs to accelerate scientific and technological development with greater emphasis on interdisciplinary science [10]. However, current interdisciplinary research in China remains largely confined to cross-disciplinary studies within either natural or social sciences, with insufficient integration.

The International Science Council's establishment presents tremendous opportunities for Chinese science. China's rapid development in recent years has created major national demands for comprehensive scientific research. The proposal of internationalization strategies such as building a community with shared future for mankind, combined with China' s diverse natural environments and differentiated socio-economic development levels, provides ideal research settings for integrated studies. The accumulation of Chinese scientific research, particularly its rapid advancement in recent years, offers a solid foundation and platform for comprehensive research.

Nevertheless, challenges persist: developing comprehensive theories, methods, and technologies to address China' s practical problems; tackling issues in research funding applications and academic achievement evaluation in interdisciplinary research [12]; and cultivating a comprehensive talent pool with broad international vision and multidisciplinary backgrounds.

At this critical moment in human development history, every researcher bears heavy responsibility. For Chinese researchers, future development requires aligning with international scientific trends, promoting rapid growth in domestic interdisciplinary research between natural and social sciences, establishing new interdisciplinary laboratories, learning from other countries' approaches to interdisciplinary challenges, and proposing solutions tailored to China' s specific conditions to create a nurturing environment for interdisciplinary research.

Researchers in geography and ecology, in particular, must respond to the era' s major challenges of global change and sustainable development. The essence of geography and ecology lies in studying human-environment relationships, characterized by comprehensiveness, interdisciplinarity, and regionalism. Interdisciplinary research between natural and social sciences [13-14] now encounters unprecedented development opportunities. Ecological research emphasizes the coupling mechanisms of human-environment interactions, combining multidisciplinary knowledge and methods from natural and social sciences to fully demonstrate comprehensive characteristics [15]. Based on the UN' s 17 Sustainable

Development Goals, focusing on intergenerational and regional equity research, these fields can provide scientific support for policy-making and achieving sustainable development at global and regional scales, shaping future sustainable human-nature relationships.

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