Implementing the New Development Philosophy of the Belt and Road Initiative to Promote High-Quality Development of the China-Sri Lanka Joint Science and Education Center (Postprint)

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Abstract

The Chinese Academy of Sciences (CAS) has fully, accurately, and comprehensively implemented the new development philosophy, strategically positioned itself for Belt and Road science and technology cooperation, pioneeringly established ten overseas centers, and carried out a series of groundbreaking international science and technology cooperation initiatives, collaborating with countries participating in the "21st Century Maritime Silk Road" on innovative research and the cultivation of scientific and technological innovation talents while balancing international academic frontiers with local livelihood development. This article, taking the high-quality development of the CAS China-Sri Lanka Joint Center for Education and Research as a case study, elaborates on the achievements of high-quality China-Sri Lanka science and education integration over the past decade of jointly building the Belt and Road, and offers reflections and recommendations for the future development direction of China-Sri Lanka science and education cooperation.

Full Text

Abstract

The Chinese Academy of Sciences (CAS) has fully and accurately implemented the new development philosophy, laid out scientific and technological cooperation under the Belt and Road Initiative, and pioneeringly established 10 overseas centers. CAS has carried out a series of groundbreaking international scientific and technological cooperation initiatives, collaborating with countries along the

21st Century Maritime Silk Road on innovative research and cultivation of scientific and technological talent while balancing international academic frontiers with local livelihood development. Taking the high-quality development of the China-Sri Lanka Joint Center for Education and Research (CSL-CER) as an example, this article elaborates on the achievements of China-Sri Lanka science and education integration over the past decade of Belt and Road co-construction, and offers reflections and recommendations for the future direction of China-Sri Lanka science and education cooperation.

1. China-Sri Lanka Science and Education Cooperation Needs

Sri Lanka is an Indian Ocean island nation at the southern tip of the Indian subcontinent with a strategically critical geographic location. Situated between the Arabian Sea and the Bay of Bengal, it serves as one of the most important supply points on the essential east-west trade routes and represents a key node of the 21st Century Maritime Silk Road [2]. With a weak scientific and technological foundation and shortage of talent, Sri Lanka frequently experiences marine tropical storms, torrential rains, and other natural disasters. Following the 2004 Indian Ocean tsunami, the 2019 terrorist attacks, and the 2022 economic crisis, the country' s demand for scientific and technological cooperation with China has grown increasingly strong.

Sri Lanka has long prioritized marine disaster prevention and mitigation as well as environmental protection. Its surrounding waters constitute a region of intense tropical material and energy exchange in the Indian Ocean and one of the most active areas for South Asian monsoon activity [2], influencing precipitation and climate change in China. However, due to insufficient marine research capacity, Sri Lanka lacks in-depth understanding of key aspects of marine disaster prevention and mitigation, such as the characteristic patterns of marine hydrometeorological elements and wave attenuation mechanisms of mangroves, and suffers from inadequate marine environmental forecasting capabilities, resulting in substantial casualties and property losses annually. The Colombo Port City and Hambantota Port—key flagship projects of the Belt and Road Initiative—have strong requirements for marine environmental support.

In recent years, Sri Lanka has gradually recognized the importance of biodiversity conservation and sustainable utilization. Approximately 2% of its coastline hosts coral reef distribution areas, primarily fringing reefs, with 289 known coral species. However, high temperatures in 1998 caused massive coral mortality, with death rates reaching 100% in some areas. Through remote sensing data analysis, Sri Lankan experts predict that over the next 30 years, coral reefs on Sri Lanka' s east coast may decrease by 5.54% and those on the west coast by 17.76% [3], indicating an extremely severe situation for coral reef ecosystem protection. Meanwhile, Sri Lanka lacks breeding technologies for aquaculture species such as sea cucumbers, fish, shrimp, and crabs, as well as techniques for developing mangrove biological resources. As a world-renowned whale-watching

destination, the country has insufficient understanding of cetacean ecosystems, population dynamics, migration patterns, and habitat environmental factors, posing unknown risks.

Additionally, north-central Sri Lanka has long been plagued by chronic kidney disease of unknown etiology (CKDu), affecting up to 400,000 people, mostly male laborers. This disease is associated with drinking water and water environments, has persistently troubled central Sri Lanka, and has drawn attention from successive governments. The CSL-CER aims to address drinking water and water environment issues through safe water supply technologies [4].

Currently, following its recent economic crisis, Sri Lanka is in a period of economic weakness and urgently needs scientific and technological innovation to drive industrial and economic recovery. Sri Lankan institutions have continuously expressed their desire to strengthen cooperation with CAS across multiple fields, including marine economy and sustainable resource development. As of December 2023, CAS has signed eight ministerial-level agreements (including memoranda of understanding) with Sri Lankan ministries such as the Ministry of Higher Education and the Ministry of Water Supply, along with over 30 other types of cooperation agreements.

2. Significance and Progress of High-Quality Development of CSL-CER

2.1 Significance of High-Quality Development

The new development philosophy provides strategic guidance for entering new development stages and building new development patterns. Promoting high-quality development of the CSL-CER requires implementing the new development philosophy with new breakthroughs to achieve new effectiveness in international science and education cooperation [5]. According to the cooperation plans of both sides, CAS, relying on the CSL-CER platform, is building a marine environmental observation network for Sri Lanka and its surrounding waters and a numerical forecasting system R&D platform, conducting ecosystem surveys and research and technology demonstrations for drinking water safety and water environments, carrying out joint underwater archaeology, and developing anti-corrosion materials and technologies. These collaborations have enhanced Sri Lanka' s risk management and forecasting capabilities, provided scientific and technological support for understanding the baseline conditions of its water ecological resources, supplied foundational data for green ecological development and sustainable resource utilization, improved Sri Lanka' s drinking water safety and security capacity, and strengthened exchanges in scientific and technological archaeology and cultural bonds between China and Sri Lanka. This not only promotes people-to-people connectivity and win-win cooperation but also provides decision-making support for relevant management departments [2].

2.2.1 Innovative and Safe Development: Establishing a Three-Dimensional Marine Observation Network and Forecasting System to Serve Sri Lanka' s Disaster Prevention and Mitigation

In terms of observation network construction, the CSL-CER—targeting tropical storms, torrential rains, and other disasters triggered by air-sea interactions under monsoon climate conditions—has collaborated with Sri Lankan partners since 2012 to build a coastal marine environmental observation network in Sri Lanka. Employing a combination of land-based, nearshore, and offshore observations alongside time-series monitoring and cruise surveys, multiple observation stations have been established across Sri Lanka to achieve long-term, stable, and effective monitoring of marine atmospheric boundary layers, monsoon circulation, and nearshore marine environmental elements. Data obtained from this observation network is shared by both parties, providing observational support for research on Sri Lanka' s marine disaster forecasting and causal mechanisms, engineering environmental support, and environmental ecology studies [2]. This network has provided crucial scientific, technological, and infrastructural foundations for Sri Lanka to enhance its understanding of monsoon climate and marine weather environments and improve the management capabilities of relevant institutions.

Regarding forecasting system construction, the "Sri Lanka Marine Environmental Prediction and Forecasting System"has been deployed for real-time operation at the University of Ruhuna and disseminated to relevant departments including marine, fisheries, and environmental agencies, providing marine environmental data support for fishermen, engineering projects, and maritime activities. As Sri Lankan demands continue to rise, system requirements have also increased. According to preliminary assessment feedback from the University of Ruhuna, the forecasting system has significantly reduced casualties and property losses in Sri Lanka. Local fishermen who regularly receive forecast and warning information recognize it as a forecasting system jointly developed by Chinese and Sri Lankan universities—a prime example of scientific and technological cooperation benefiting people' s livelihoods [2]. The system also provided timely forecast information during emergency incidents such as the oil tanker fire in eastern Sri Lanka in September 2020 and the cargo ship explosion near Colombo in May 2021, assisting emergency response efforts and earning gratitude from Sri Lankan government agencies and positive coverage from local media .

2.2.2 Green and Shared Development: Protecting Ecological Environments and Promoting Sustainable Development of Characteristic Ecological Resources

In marine ecosystem protection, the CSL-CER not only provides environmental monitoring and forecasting services for ecosystem conservation but has also conducted resource surveys, conservation breeding, and other multifaceted work on coral reefs, mangroves, and cetaceans. In early 2023, corals were discovered near Colombo Port City, prompting the CSL-CER to immediately launch joint

investigation and research, confirming this new coral distribution site. Through analysis of dozens of coral and reef fish species, the center identified over 30 coral species with densities reaching 60 individuals per square meter and more than 80 fish species. This newly discovered coral site has created a new biodiversity hotspot in an artificial environment, making its discovery particularly significant at this time. Over the past 30 years, coral reefs in Sri Lankan waters have been declining annually due to global climate change. At the subsequent China-Sri Lanka Joint Symposium on Coral Reef Ecology, experts from various countries unanimously recognized this as an important event for Sri Lanka' s coral reef ecosystem, concluding that Sri Lanka urgently needs to introduce ecological conservation technologies. The CSL-CER has successively launched joint research on coral reef ecosystems and applications of ecological protection technologies with Sri Lankan scientific institutions . Numerous enthusiastic citizens and live-streaming enthusiasts have been attracted to the new coral distribution area and joint symposium, expressing warm support for China-Sri Lanka collaborative coral conservation research. With support from both governments, this cooperation is expected to become a model for China-Sri Lanka co-construction of marine economy and ecological civilization under the Belt and Road Initiative.

Regarding sustainable development of marine ecological resources, the CSL-CER has reached cooperative consensus with Sri Lankan marine research institutions. The waters around Sri Lanka are world-renowned cetacean habitats with diverse species exhibiting seasonal migration patterns, and whale-watching represents an important tourism industry for the country. China-Sri Lanka partners have formulated next-step investigation and research plans to support cetacean population and habitat conservation. Both sides have also made progress in mangrove resource surveys and bioactive substance research, earning high praise from Sri Lankan partners and significantly enhancing their understanding of mangrove resources and sustainable utilization.

2.2.3 Coordinated, Open and Shared Development: Jointly Conducting Water Environment and Water Technology Research

The pathogenic mechanism of chronic kidney disease of unknown etiology (CKDu) in north-central Sri Lanka remains unclear, though successive governments have attached great importance to drinking water safety issues. CAS has collaborated with Sri Lanka' s National Water Supply and Drainage Board, University of Peradeniya, and other institutions on water environment and water technology research demonstration projects [2] to enhance Sri Lanka' s drinking water safety and security capabilities while also promoting the international expansion of China' s water treatment technologies and equipment.

In terms of safe water supply and water environment research, through field investigations in disease-endemic areas and animal experiments, researchers have meticulously mapped groundwater quality in CKDu-endemic regions, discover-

ing that the combined effects of high concentrations of fluoride and calcium ions in groundwater and high temperatures may be important causes of kidney disease. By identifying typical pollutants in rainwater at different storage stages in Sri Lanka' s dry zones, key technical indicators for subsequent purification processes have been determined. A water supply management platform scheme for CKDu high-incidence areas in Sri Lanka has been constructed, providing scientific basis and technical assistance for Sri Lanka' s national water supply and drainage infrastructure construction planning and water resources management planning. National water resources spatiotemporal distribution has been investigated to provide scientific solutions for local government water resources development and utilization. The geochemical elemental composition of Sri Lanka' s rock, soil, and groundwater has been surveyed to provide scientific basis for ensuring the safety of underground drinking water sources.

Regarding water treatment technology, three sets of groundwater treatment demonstration equipment are operating stably in Sri Lanka' s CKDu-endemic areas, continuously providing safe drinking water to thousands of residents and over 1,000 students. Four large-scale and dozens of small-scale water supply devices targeting CKDu-endemic areas were commissioned by the end of 2022. Based on advanced instrumentation, the operations team has established and validated water quality parameter testing methods and can now provide testing services for nearly 300 water quality parameters to Sri Lanka and South Asia. An electrocoagulation-sedimentation-filtration-UV disinfection water purification process has been developed. This process requires no external water treatment chemicals, solving the problems of cumbersome operation and maintenance and poor water quality stability in rural water supply systems. A newly developed, easily maintained assembled drinking water plant has been integrated and deployed in Methihakka Village in Sri Lanka' s Central Province, addressing the long-standing problem of villagers directly drinking simply filtered surface river water. The Chinese Ambassador to Sri Lanka, Sri Lankan State Minister of Water Supply, and local villagers jointly attended the commissioning ceremony, and new water treatment equipment will continue to be deployed across Sri Lanka. Advanced water treatment technologies and equipment have made substantive contributions to improving local water supply conditions .

2.2.4 Capacity Building and Shared Development: Jointly Training Scientific and Technological Talent

CAS supports Sri Lankan students pursuing master' s and doctoral degrees at the University of Chinese Academy of Sciences (UCAS) through funding programs such as the Alliance of International Science Organizations (ANSO) Scholarship and CAS Scholarship, cultivating high-level scientific and technological talent. UCAS and the CSL-CER have enrolled over 100 Sri Lankan students and successfully launched the "Marine Environmental Science Sri Lankan Master's Program."Most Sri Lankan students have demonstrated excellent academic

performance in China. For example, master' s graduate J. Bimali Koongolla received the "2021 UCAS Outstanding International Graduate" honor. The majority of Sri Lankan students actively return to work in their home country, playing important roles in their institutions. For instance, Madhubhashini Makehelwala, Ph.D., who completed her studies and returned home, now serves as Deputy Director of the China-Sri Lanka Joint Center for Water Technology Research and Demonstration under Sri Lanka' s Ministry of Water Supply, and her first-author paper won the 2023 Sri Lankan Presidential Award for Scientific Research. The graduate community sends New Year greetings to the CSL-CER and their mentors every Spring Festival and actively organizes alumni activities.

CAS has also promoted multi-level and multi-form talent cultivation methods, including training courses and visiting scholar collaborations in various disciplines. CAS has led the organization of multiple Belt and Road science and technology training courses, such as the Belt and Road International Training Course on Coastal Ecological Aquaculture and Biotechnology, the Belt and Road International Training Course on Experimental Testing Techniques for Young Scientists, and the Water and Environment International Training Course, with Sri Lankan participants actively attending and achieving enthusiastic responses. Seven Sri Lankan scholars have visited China for collaborative research through CAS' s President' s International Fellowship Initiative (PIFI) and ANSO, among whom PIFI scholar Prof. S. Malaviarachchi participated in a focus group meeting on nature-based solutions held in Sri Lanka in March 2023, presenting cooperation achievements in water supply security between China and Sri Lanka.

3. Reflections and Recommendations

Under the new development paradigm, the CSL-CER will fully unleash its potential to enable countries around the Indian Ocean participating in Belt and Road co-construction to share high-quality development opportunities in science and education cooperation. Collaborative research and technology application demonstrations will be conducted in multiple fields including sustainable development under climate change, disaster prevention and mitigation, and drinking water safety and security, with multi-disciplinary integration and coordination, targeting both international scientific and technological frontiers and people-to-people connectivity projects. More scientists will be funded to visit, study, and work in China, cultivating more scientific and technological talent to strengthen the China-Sri Lanka science and education cooperation team.

The "industry-academia-research" cooperation model will be fully utilized to not only enhance local capacities to address climate change and sustainable development issues through collaborative research and talent cultivation but also facilitate the entry of China' s new industries such as renewable energy development and application into local markets, adapting innovative technologies for local conditions and delivering corresponding innovative talent to achieve mutual benefit and win-win outcomes. By promoting cooperation models that

combine scientific and technological innovation with solving livelihood issues and adopting the "industry-academia-research" approach, the demonstration effect of China-Sri Lanka science and education cooperation will be leveraged to attract countries around the Indian Ocean participating in Belt and Road co-construction to jointly build regional cooperation platforms. China' s oceanic scientific research capabilities in the Indian Ocean and the advantages of China-Sri Lanka cooperation demonstrations will be fully utilized to support international scientific programs involving the Indian Ocean region across various disciplines.

Chinese scientists help Sri Lanka cope with marine disasters, climate change. (2021-06-03). http://www.xinhuanet.com//english/2021-06/04/c_{139988542}.htm?from=timeline&isappinstalled=0.

Sri Lankan, Chinese experts hold symposium on coral reef ecology. (2023-06-08). https://eng.yidaiyilu.gov.cn/p/322737.html.

JRDC. Donation of a novel, easily-maintained assembly drinking water plant from China to Sri Lanka. (2023-07-01). https://jrdc.lk/news/donation-of-a-novel-easily-maintained-assembly-drinking-water-plant-from-china-to-sri-lanka/.

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