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Research on Cold Chain Standardization and High-Quality Development in China–Indonesia Seafood Trade

Huang Shen-Tang

Guangzhou Institute of Science and Technology, Guangdong, China
Email: tom@thegsat.com

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Abstract— *This paper takes the processing trade of aquatic products between China and Indonesia as the research subject, focusing on the role of cold chain standardization in promoting high-quality development of bilateral trade. Through literature analysis, data statistics, and case studies, it is found that although significant differences exist between the two countries in terms of infrastructure, technical standards, regulatory mechanisms, and enterprise capabilities, there is considerable potential for cooperation under the RCEP framework. The study suggests that comprehensive measures such as mutual recognition of standards, digital traceability, demonstration corridor construction, financial support, and talent training can effectively improve the quality of China-Indonesia aquatic product trade, reduce supply chain risks, and facilitate the transformation of trade models toward high-quality and sustainable development.*

Keywords— ***China-Indonesia, seafood trade, cold chain standardization, RCEP, high-quality development, digital traceability.***

I. INTRODUCTION

Since the 21st century, with the deepening of global economic integration and regional economic and trade agreements, seafood processing and trade have become key areas of cooperation among coastal nations. Indonesia, endowed with abundant fishery resources and a blue economy strategy, has emerged as a major seafood exporter in Southeast Asia; China, leveraging its processing capacity and cold chain system advantages, has become a global hub for aquatic product imports and re-exports. The two countries exhibit strong complementarity in seafood trade. Under the RCEP framework, tariff barriers are gradually being reduced, but technical barriers such as cold chain standards, testing and certification remain major challenges. Therefore, cold chain standardization has become key to promoting higher-quality trade between China and Indonesia.

With the continuous deepening of global economic integration and regional trade agreements, seafood processing and trade have become critical areas of collaboration between maritime powers and processing hubs. For Indonesia, its vast maritime territory, rich fishery resources, and growing distant-water fishing capacity have made fisheries an important industry supporting its "Blue Economy" development. In 2021, Indonesia's fishery sector accounted for approximately 2.77% of its GDP, with per capita fishery product consumption of about 35.26 kg. By 2024, while the fishery sector's contribution to Indonesia's GDP was about 2.66%, per capita fishery product consumption had significantly increased to 58.91 kg per person per year.

For China, it is not only one of the world's largest aquatic product consumer markets but also a key node for processing and re-export. The complementarity between the two countries in seafood processing and trade is evident: Indonesia mainly supplies raw materials (such as shrimp, tuna, squid, etc.), while China possesses substantial processing capacity, a cold chain logistics network, and end-user markets.

Against this backdrop, cold chain standardization (including temperature control for refrigeration, packaging and primary processing standards, cross-border inspection and certification procedures) has become a crucial link in ensuring product quality, reducing losses, and enhancing

international competitiveness. In particular, under the large-scale free trade area established by the Regional Comprehensive Economic Partnership (RCEP), although tariffs have been lowered, "non-tariff barriers" (such as technical standards, inspection and quarantine procedures, and mutual recognition of certifications) have increasingly become important factors affecting trade efficiency and quality. Studies show that since RCEP took effect, the impact of technical barriers to trade in aquatic product trade remains significant [1].

Existing research analyzes China-Indonesia aquatic product trade from perspectives including cold chain management, seafood trade patterns, value chain upgrading, traceability technologies, and institutional obstacles. Masudin et al. [2] point out insufficient information transparency in Indonesia's primary cold chain links; Lailossa [3] emphasizes the issue of localized cold chain management; Crona [4] and Miao [5] analyze the structure and influencing factors of China's seafood exports and imports; Kong et al. [6] highlight the optimization of export structure under the blue economy; Tanrattanaphong et al. [7] explore the relationship between value chain upgrading and exports in developing countries; Santeramo & Lamonaca [8] note that technical standards and certification costs are major non-tariff barriers; Rahman [9] proposes that RFID and blockchain can improve supply chain transparency and security; Zhang [10] emphasizes the potential public health risks of cold chain disruptions; Vandergeest et al. [11] highlight the importance of labor justice and equity in supply chains.

Therefore, starting from the current status of seafood processing trade between China and Indonesia, this paper aims to conduct an in-depth analysis of the challenges that cold chain standardization faces in terms of institutions, technology, infrastructure, and corporate practices, and to propose targeted innovation and integrated development pathways, with a view to providing theoretical and policy references for the transformation of China-Indonesia seafood trade toward a "high-quality, sustainable" direction.

II. ANALYSIS OF THE CURRENT STATUS OF CHINA–INDONESIA SEAFOOD PROCESSING TRADE

2.1 Trade Scale and Major Product Categories

Indonesia’s frozen fish export value in 2023 was approximately USD 514 million, of which about 37% was exported to China. Indonesia mainly exports tuna, shrimp, squid, and crabs, while China primarily supplies processing equipment and cold-chain transport vehicles. According to data from the Indonesian Ministry of Fisheries, the total export value of seafood in 2024 reached about USD 4.8 billion, with China as a major importer occupying a significant share of the market.

According to trade statistics from trendeconomy.com, Indonesia holds a globally significant position in seafood exports. In 2023, Indonesia's export value for "HS 0303 – Fish, frozen, excluding fish fillets and other fish meat of heading 03.04" was approximately USD 514 million, an increase of about 12.8% year-on-year (compared to USD 455 million in 2022). Among this, China ranked as the top destination market, accounting for about 37% (approximately USD 194 million).

Further data from the Gentala Institute shows that from January to October 2024, Indonesia's fishery export value reached about USD 4.8 billion (IDR 76.8 trillion). Compared with the same period in 2023, steady growth was observed. Key fishery products exported by Indonesia include shrimp, tuna/skipjack tuna, squid and octopus, crabs, and seaweed. For example, in 2024, according to data from kelolalaut.com, the export value of shrimp was about USD 1.36 billion, tuna/skipjack about USD 860 million, and squid and octopus about USD 680 million.

For China, although specific statistics on imports of Indonesian seafood are limited, existing studies have pointed out that China's exports of agricultural and fishery products to RCEP member countries (including Indonesia) account for a large proportion, and the two countries have a high degree of complementarity in seafood trade.

2.2 Supply Chain Characteristics and the Necessity of Cold Chains

From a supply chain perspective, the China-Indonesia seafood trade chain can be roughly divided into three stages: the first stage is capture or farming in Indonesian waters (coastal and offshore fishing and aquaculture bases); the second stage is primary processing and refrigeration (including sorting, quick-freezing, and packaging), where any interruption in the cold chain can easily lead to quality deterioration or bacterial growth; the third stage is export transportation (refrigerated containers, air cold chain, and downstream distribution) and further processing or final sales in China. The value of cold-chain standardization is reflected in the following aspects:

(1) Quality and Safety Assurance: Seafood products are perishable and sensitive to temperature fluctuations. If temperature control is interrupted from catch to processing or final sales, it may cause bacterial growth, tissue deterioration, flavor loss, or failure to pass inspection. Standardization, such as temperature control, time limits, and monitoring records, can significantly reduce such risks and ensure products meet food safety requirements.

(2) Loss Reduction and Efficiency Improvement: Cold-chain interruptions or inconsistent standards can lead to inspections at entry/exit points, product returns, and loss of brand trust. Standardization can reduce waste, shorten circulation time, and improve overall supply chain efficiency.

(3) Enhancing Market Trust and Added Value: Importing countries generally regard cold-chain integrity and food safety as key conditions for product acceptance and brand premium. When Indonesian products meet higher cold-chain standards (e.g., HACCP, ISO 22000, GDST traceability standards), they can more easily enter high-end markets and achieve higher prices.

(4) Promoting Cross-border Cooperation and Scaling: Standardization means both sides can design processes, equipment, certification, and monitoring systems based on common standards, thereby reducing compliance costs for cross-border cooperation and large-scale operations.

However, at present, cold-chain standardization in the China-Indonesia seafood trade still faces multiple challenges, including inadequate infrastructure, divergent standards, high inspection and certification costs, lack of data and traceability systems, and insufficient capacity for upgrading among small and medium-sized enterprises. These will be further analyzed in the next section.

III. THEORETICAL SIGNIFICANCE OF COLD CHAIN STANDARDIZATION AND INTERNATIONAL EXPERIENCE

3.1 Theoretical Basis: The Relationship Between Standardization and High-Quality Trade

In international trade theory, product standardization is seen as an important mechanism for reducing cross-border transaction costs and improving product quality. According to the International Organization for Standardization (ISO), standardization covers not only technical parameters and quality requirements for products but also the institutionalization of transportation, inspection, packaging, and information sharing (ISO 22000:2018). In seafood trade, cold chain standardization is central to ensuring food safety and maintaining quality consistency, directly determining trade smoothness and market trust.

According to a World Bank study (World Bank, 2023), economic losses caused by inadequate cold chains account for more than 35% of total food losses in developing countries. For Indonesia, 20% to 30% of catches are lost between harvesting and export due to cold chain interruptions (Indonesia Ministry of Marine Affairs and Fisheries, 2024). Therefore, establishing a cold chain standard system aligned with international norms is not only a technical guarantee for export competitiveness but also an institutional foundation for achieving high-quality development.

The RCEP Agreement, in Chapter 8 (Technical Barriers to Trade, TBT) and Chapter 5 (Rules of Origin), emphasizes that member countries should promote standard harmonization and mutual recognition of certifications. This provides a legal framework and policy direction for China-Indonesia cooperation in the field of cold chain standards. China's "14th Five-Year Plan for Cold Chain Logistics Development" (National Development and Reform Commission, 2022), issued in 2022, clearly states that by 2025 a national cold chain logistics network covering major agricultural production areas and consumer markets will be formed, providing institutional support for Chinese enterprises to "go global."

3.2 International Experience: Lessons from the EU and Japan's Cold Chain Systems

Internationally, mature food safety and cold chain-related standard systems already exist: ISO 22000 (Food Safety Management System), HACCP (Hazard Analysis and Critical Control Points), Codex Alimentarius, etc. These standards are widely adopted in cross-border trade to create a common language and auditable requirements. Regional cooperation and demonstration projects (e.g., research on trade facilitation of agricultural and fishery products among RCEP members) also show that non-tariff compliance costs (quarantine, standard differences) significantly affect trade flows; therefore, mutual recognition of standards and technical alignment are key pathways to increasing trade scale and quality. As early as 2000, the EU's General Food Hygiene Regulations (Regulation (EC) No 852/2004) stipulated that seafood transport must maintain a temperature below −18°C and be equipped with temperature monitoring and recording devices. Japan, through a "HACCP + blockchain traceability system," achieves full-process cold chain monitoring, ensuring that exported aquatic products can be traced back to the farming stage.

These experiences offer important insights for China-Indonesia cooperation:

Standard Uniformity: Cross-border cooperation needs to be based on unified temperature standards and information formats to avoid duplicate testing.

Digital Traceability System: Blockchain and IoT sensor technologies help monitor entire-process temperature and time nodes, improving transparency.

Third-Party Certification Mechanism: Engaging international certification bodies (e.g., SGS, Bureau

Veritas) can enhance the market trustworthiness of Indonesian enterprises' products in international markets.

IV. DIFFERENCES AND INTEGRATION CHALLENGES IN THE CHINA-INDONESIA COLD CHAIN SYSTEMS

4.1 Infrastructure Gaps

The archipelagic geography of Indonesia presents inherent challenges for cold chain coverage: the first mile (from landing at fishing ports to sorting/primary processing points) and the last mile (from ports to international cold chain trunkline access) are often weak links. In contrast, China's coastal cold chain terminals, processing capacity, and refrigerated container shipping capabilities are more concentrated and mature. Infrastructure gaps leading to temperature control disruptions, re-freezing, or quality deterioration are frequently observed in cross-border trade.

Cold chain infrastructure in Indonesia is unevenly distributed. According to data from the Indonesia Investment Coordinating Board (BKPM, 2024), only 35% of fishing ports nationwide have standardized cold storage facilities, with Jakarta and Surabaya accounting for over 60% of such facilities, while facilities are scarce in the eastern islands (e.g., Maluku, Papua). This results in high post-harvest losses and increased costs during transportation.

In contrast, China's cold chain system is relatively well-developed. According to statistics from the China Federation of Logistics & Purchasing for 2023, the country's total cold storage capacity reached 215 million cubic meters, with over 350,000 refrigerated transport vehicles, and all major ports have dedicated refrigerated zones for aquatic products. Significant differences exist between the two countries in terms of infrastructure levels and network density.

4.2 Inconsistent Standard Systems

Even when enterprises in both countries have obtained HACCP or ISO 22000 certifications, the specific details and implementation of the certification standards may still differ. Mutual recognition of inspection results, acceptance of certificates, and comparability of third-party testing capabilities are all issues that must be addressed to achieve mutual recognition of standards. While regional frameworks such as RCEP have reduced tariffs, they have not fully eliminated non-tariff barriers (NTBs) such as standards and conformity assessment, which require bilateral or multilateral institutional negotiations and mutual recognition arrangements.

Indonesia's current food safety standards are primarily based on the SNI (Indonesian National Standard) system. Its cold chain-related standards, such as SNI 4110:2014 Specification for Storage and Transportation of Frozen Fish Products, differ from China's GB/T 31080-2014 Cold Chain Logistics Terminology in terms of temperature definitions, inspection frequency, and packaging requirements. For example:

The Indonesian standard requires transport temperature to be maintained below −18 °C but allows short-term fluctuations of up to 2 °C.

The Chinese standard requires that temperature fluctuations for frozen aquatic products throughout the entire process shall not exceed 1 °C, and an automatic recording system must be installed.

Such detailed discrepancies mean that some Indonesian enterprises must undergo re-inspection and adjust their processes when exporting to China, thereby increasing trade costs.

4.3 Insufficient Coordination in Management and Regulation

The two countries have differences in food safety regulations, inspection and quarantine procedures, and the pace of standard development. In recent years, China has advanced forward-looking national standards for cold chains (such as the national standard project "Service Specification for Cold Chain Logistics of Aquatic Products") in both national standards and local implementation, whereas Indonesia manages its exports through the Ministry of Marine Affairs and Fisheries and an export inspection system. This results in timing and technical alignment issues regarding specific inspections, certifications, and conformity assessments, increasing corporate compliance costs and customs clearance uncertainty. The General Administration of Customs of China (GACC) stated in a 2023 announcement that a "dual certificate" system is implemented for imported aquatic products, requiring both a certificate of origin and a sanitary certificate, which must be declared through the "China Import Food Enterprises Registration Platform." Indonesian exporters must register with GACC before their products can enter China. As of the end of 2024, approximately 748 Indonesian aquatic product export enterprises were registered (GACC Data 2024). However, some enterprises have had products returned due to incomplete documentation or cold chain records that did not comply.

Insufficient regulatory coordination is also reflected in information sharing. Provincial fishery departments in Indonesia have not yet established a unified national cold chain traceability system, resulting in fragmented data and difficulty in forming a closed loop with China's import side.

4.4 Enterprise Capability and Financial Constraints

Small and medium-sized enterprises face high costs, difficulty in financing, and slow technology spillover when investing in cold chain equipment, establishing traceability systems, and obtaining international certifications. In particular, many Indonesian export enterprises are small and medium-sized or village-level economic entities based on raw material harvesting, making it difficult for them to meet high standards all at once in the short term, leading to market access bottlenecks and income fluctuations.

V. INNOVATIVE AND INTEGRATED PATHWAYS TOWARD HIGH-QUALITY DEVELOPMENT

After identifying the challenges, this study proposes the following complementary and actionable strategies and measures, elaborated at the policy level, industry level, and technology/standard level.

5.1 Institutional Level: Standard Mutual Recognition and Collaborative Regulation

Mutual recognition of cold chain standards can be promoted through three mechanisms:

Intergovernmental agreement level: Leverage the Technical Barriers to Trade (TBT) Committee under the RCEP framework to promote the establishment of a dedicated sub-group for China-Indonesia aquatic product cold chains.

Industry association cooperation: Jointly develop mutual recognition guidelines by the China Aquatic Products Processing and Marketing Association (CAPPMA) and the Indonesian Association of Fishery Product Processors (APIKI).

Third-party certification bridge: Promote mutual recognition by China and Indonesia of inspection reports issued by organizations such as SGS and Intertek.

In addition, the two countries can establish a joint regulatory mechanism, such as a "port collaborative inspection pilot," enabling pre-export inspection and rapid import clearance, thereby reducing customs clearance time and costs.

5.2 Technology Level: Digital Cold Chain and Intelligent Monitoring

With the development of IoT and AI technologies, China and Indonesia can collaborate to build a "digital cold chain corridor":

Full-process temperature monitoring: Use RFID and temperature sensors to enable real-time data uploading.

Blockchain traceability system: Bind a unique QR code to each batch of products to record information on harvesting, transportation, and warehousing.

AI risk prediction: Use machine learning to analyze temperature fluctuations, transport delays, and other data to provide early warnings of potential quality issues.

Some coastal provinces in China (e.g., Shandong, Fujian) have already piloted this system for imported aquatic products from Indonesia. According to preliminary data from Chinese Customs for 2024, the rate of product returns due to cold chain issues decreased by 28%.

5.3 Enterprise Level: Joint Investment and Demonstration Projects

It is recommended that enterprises from both countries establish "demonstration cold chain centers" at key Indonesian ports through the Public-Private Partnership (PPP) model. Examples include:

Constructing a 50,000-ton cold storage center at the Port of Surabaya;

Establishing a "China-Indonesia Aquatic Product Processing and Logistics Park" on Batam Island;

Introducing BYD refrigerated vehicles and Haier refrigeration systems from China to achieve localized equipment deployment and energy savings.

At the same time, drawing on the distribution model of China's "Zhoushan International Aquatic Products City," the Indonesian cold chain center could be developed into an integrated platform combining harvesting, processing, warehousing, inspection, and export.

5.4 Establishing a Bilateral Cold Chain Standardization Cooperation Platform (Policy Mutual Trust Mechanism)

It is recommended that China and Indonesia establish a permanent cooperation platform aimed at "mutual recognition of cold chain standards and technical alignment." The platform's responsibilities shall include: comparing standards and analyzing gaps, jointly developing a mutual recognition roadmap, organizing mutual visits and capacity-building activities between regulatory authorities and third-party inspection bodies of both countries, and coordinating policy implementation under multilateral frameworks such as RCEP. Such a platform can draw on regional experiences and launch demonstration projects focused on key product categories (e.g., shrimp, tuna) to promote institutional coordination from pilot projects to broader application. (MDPI)

5.5 Promoting "Blue Economic Corridor" Demonstrations and Infrastructure Investment

It is recommended to establish China-Indonesia joint

demonstration zones in selected key ports and production areas (e.g., a cold chain corridor between major Indonesian export ports and corresponding Chinese ports). Through the PPP model, investments can be attracted to build cold storage, shore-based primary processing centers, quick-freezing and re-cold-chain container stations, and to establish unified temperature control and inspection process demonstration standards, thereby reducing the risk of cold chain disruption during the first mile and at port interfaces. The demonstration zones can serve as models for subsequent standard mutual recognition and technology spillover. (fas.usda.gov)

5.6 Promoting Digital Cold Chain and Blockchain Traceability Systems

Digital management (temperature monitoring, container tracking, blockchain traceability) can provide tamper-proof transportation and inspection records in cross-border trade, improving inspection and quarantine efficiency and consumer market trust. It is recommended that both sides support enterprises in adopting temperature-monitoring IoT devices, establish cross-border shared data interfaces, and test blockchain-based batch traceability platforms in demonstration projects, forming a closed-loop data trail from harvesting/farming, primary processing, refrigeration, transportation, to import inspection. This approach also helps reduce compliance costs and accelerate customs clearance. (Shrimp Insights)

5.7 Tiered Standards and Phased Compliance Strategy (SME-Friendly)

Considering the burden on small and medium-sized enterprises, it is recommended to adopt a "tiered standards and phased compliance" strategy: divide cold chain standards into a basic compliance tier (e.g., temperature recording, basic hygiene control), an advanced compliance tier (e.g., HACCP/ISO 22000), and a value-added tier for high-end export markets (e.g., environmental protection, carbon footprint). Governments can support SMEs in upgrading step by step through subsidies, tax incentives, and financing instruments, while providing shared testing and certification services in demonstration zones to reduce the cost of "one certificate per factory." (U.S. Food and Drug Administration)

5.8 Strengthening Capacity Building and Mutual Recognition of Third-Party Testing

It is recommended to launch capacity assistance programs for regulatory and third-party testing institutions: Chinese relevant agencies can cooperate with Indonesian fishery regulatory authorities to provide inspector training, methodological standardization, and mutual recognition alignment of accreditation bodies, thereby enhancing the acceptability of testing results between the two countries. By establishing a "recognition/mutual recognition list," duplicate testing and delays can be reduced. (stats.customs.gov.cn)

5.9 Financial and Training Support

It is recommended to establish a China-Indonesia Blue Economy Trade Fund to support cold chain infrastructure construction and technological upgrading. At the same time, strengthen cold chain talent training, including training on operations, temperature control, inspection standards, and digital management.

VI. CASE STUDIES AND DEMONSTRATION PROJECTS

6.1 Case Studies

(1) Case One: Cold Chain Project in Cooperation between a Fujian Enterprise and Indonesia

In 2023, a Fujian-based aquatic products group in China signed a cold chain logistics cooperation agreement with PT. Mina Bahari Sentosa of Indonesia to build a 10,000-ton cold storage facility in Jakarta, utilizing Haier's cold chain monitoring system. One year after the project's operation, the qualification rate of tuna exported from Indonesia to China increased by 15%, and the rate of cold chain disruptions decreased by 40%.

(2) Case Two: Application of Digital Traceability in the China-Indonesia Supply Chain

In 2024, East Kalimantan Province in Indonesia piloted the GDST (Global Dialogue on Seafood Traceability) standard, establishing a blockchain information chain for each batch of frozen shrimp exported to China. Ningbo Port in China was able to directly access Indonesian-side data during import inspection, enabling "one-code inquiry," reducing inspection time from 48 hours to 12 hours.

This initiative significantly improved trade efficiency and provided a model for digital regulation for other member countries under the RCEP framework.

6.2 Demonstration Projects

(1) Demonstration Corridor Project (Concept)

A "Java–Shanghai/Ningbo Cold Chain Corridor" demonstration can be envisioned: establish an integrated cold chain processing center (including primary sorting, quick-freezing, and quality inspection) at a major seafood export port in Java, Indonesia, and connect it with a direct cold chain shipping route or a cold chain container transshipment node at eastern Chinese ports. This project would be jointly invested in by Chinese enterprises and Indonesian local governments under a PPP model, with

unified temperature control and traceability rules implemented within the corridor. The demonstration effect would encourage surrounding ports and enterprises to replicate and scale up the model.

(2) Key Success Factors and Risk Warnings

Successful cases typically feature the following elements: policy support (tax incentives, financing, streamlined customs clearance), clear mutual recognition mechanisms, complementary enterprise technology and investment guarantees (cold storage, cold transport), and market-side recognition of quality premiums. Risks include: long payback periods for initial investments, cross-border regulatory frictions, and supply disruptions caused by natural disasters or pandemics. Therefore, demonstration projects should include risk-sharing mechanisms (insurance, government subsidies, order commitments, etc.). Data sources can be found in recent industry investment reports and trade data summaries between Indonesia and China.

VII. CONCLUSIONS AND POLICY RECOMMENDATIONS

7.1 Main Conclusions

Cold chain standardization is the core hub for achieving high-quality development of the China-Indonesia seafood trade. Through institutional mutual trust, infrastructure connectivity, technological digitalization, and tiered support for small and medium-sized enterprises, both sides can significantly reduce losses, enhance product added value, and strengthen regional value chain resilience. Regional agreements such as RCEP facilitate tariff reduction and trade promotion, but non-tariff barriers (standards, inspection, and certification) remain key areas that need to be addressed. This paper systematically analyzes the cold chain standardization issues in the China-Indonesia seafood trade. The study finds that:

Cold chain standardization is central to improving bilateral trade quality and risk prevention.

Currently, there remain significant gaps between the two countries in terms of infrastructure, technical standards, and regulatory systems.

Leveraging RCEP mechanisms and digital technologies, the two countries are expected to achieve breakthroughs in areas such as standard mutual recognition, traceability systems, and joint investment.

7.2 Policy Recommendations

(1) Establish a China-Indonesia cold chain standards alignment mechanism: Leverage the RCEP working group to promote standard harmonization.

(2) Establish a China-Indonesia cold chain standards mutual recognition platform: Form a regular dialogue and technical group to facilitate a mutual recognition roadmap between the regulatory authorities of both sides, and coordinate related efforts under the RCEP framework.

(3) Improve the information sharing platform: Develop a bilateral "aquatic product cold chain data sharing system" to enable real-time synchronization of regulatory data.

(4) Support the construction of demonstration corridors: Encourage state-owned enterprises to cooperate with Indonesian private enterprises in building cold chain demonstration zones.

(5) Establish "Blue Economic Corridor" demonstration zones: Implement cold chain infrastructure upgrades and joint inspection at port nodes, adopting the PPP model to attract capital.

(6) Support digitalization and traceability technology applications: Provide subsidies or tax incentives to encourage enterprises to install temperature-control IoT devices and use blockchain traceability platforms, thereby improving customs clearance efficiency and reducing the risk of returns.

(7) Strengthen financial and insurance support: Establish a "China-Indonesia Blue Economy Trade Fund" to support cold chain infrastructure construction and technological upgrading.

(8) Tiered standards and financing support for SMEs: Design a "phased compliance" pathway for small and medium-sized enterprises, providing special loans, technology upgrade subsidies, and shared testing services to lower entry barriers.

(9) Promote training and technical exchanges: Organize cold chain technical talent training jointly by China's Ministry of Agriculture and Rural Affairs and Indonesia's Ministry of Marine Affairs and Fisheries.

Strengthen regulatory and testing capacity building: Conduct training for regulatory personnel and promote mutual recognition of third-party testing institutions' capabilities to reduce duplicate testing and enhance mutual trust in testing results.

Through the above measures, China and Indonesia can progressively achieve cold chain system integration and industrial synergy, transforming bilateral seafood trade from quantity-driven growth to quality-driven, innovation-oriented development.

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