

BEYOND THE ICE: VALUE CHAINS AND STRENGTHENING THE COMPETITIVENESS OF AMBON FROZEN FISH

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ABSTRAK

Industri ikan beku di Pulau Ambon memainkan peran penting dalam menopang perekonomian pesisir sekaligus menjadi bagian dari jaringan perdagangan global perikanan Indonesia. Penelitian ini menganalisis struktur dan tata kelola rantai nilai ikan beku untuk memahami distribusi nilai tambah, peran kelembagaan, serta tantangan daya saing industri lokal. Data diperoleh melalui observasi lapangan, wawancara dengan pelaku rantai pasok, dan analisis peta rantai nilai. Hasil penelitian menunjukkan bahwa buyer dan eksportir di Surabaya memiliki kendali dominan atas harga dan standar mutu, sedangkan nelayan dan industri lokal memiliki posisi tawar yang lemah akibat keterbatasan modal dan infrastruktur logistik. Pemerintah daerah melalui Tim Pengendali Inflasi Daerah (TPID) berperan dalam menjaga keseimbangan antara ekspor dan pasokan lokal, meskipun efektivitasnya masih terbatas oleh koordinasi kelembagaan. Dua tantangan utama yang diidentifikasi adalah tingginya biaya logistik dan ketergantungan terhadap buyer tunggal. Untuk memperkuat daya saing, diperlukan strategi terpadu yang mencakup efisiensi rantai pasok, diversifikasi pasar, penguatan sistem logistik dingin, serta penerapan traceability system dan digital value chain guna mendukung branding geografis produk perikanan pulau Ambon. Temuan ini menegaskan pentingnya transformasi struktural menuju ekonomi berbasis nilai yang berkelanjutan dan inklusif.

Kata Kunci: :Rantai Nilai Perikanan, Industri Ikan Beku, Daya Saing, Logistik Maritim.

ABSTRACT

The frozen fish industry in Ambon Island plays a vital role in sustaining coastal economies while integrating into Indonesia's global seafood trade network. This study examines the structure and governance of the frozen fish value chain to understand value distribution, institutional roles, and competitiveness challenges faced by local industries. Data were collected through field observations, stakeholder interviews, and value chain mapping. The findings reveal that buyers and exporters in Surabaya hold dominant control over pricing and quality standards, while fishermen and local processors remain in weak bargaining positions due to limited capital and logistics infrastructure. The regional government, through the Regional Inflation Control Team (TPID), acts as a balancing mechanism between export demands and domestic supply, although its effectiveness is constrained by institutional coordination. Two major structural issues were identified: high logistics costs and dependence on a single buyer. To enhance competitiveness, an integrated strategy is required, combining supply chain efficiency, market diversification, cold-chain infrastructure strengthening, and the adoption of traceability and digital value chain systems to support the development of geographical branding for Ambon's fishery products. The study highlights the necessity of a structural shift toward a value-based, sustainable, and inclusive fisheries economy.

Keywords: Fisheries Value Chain, Frozen Fish Industry, Competitiveness, Maritime Logistics.

1. INTRODUCTION

The frozen fish industry has become a symbol of coastal economic transformation in many fisheries-producing regions across Indonesia. In Ambon Island, this industry not only preserves the freshness of marine products but also maintains the economic and social values embedded in every kilogram of product leaving the port. With its strategic geographical position at the heart of Maluku waters, Ambon functions as a connecting hub between fishing grounds in eastern Indonesia and export centers in Java. As is widely known, the Maluku region consists of many islands and maritime areas that are larger than the surrounding landmasses, making it rich in marine and fishery resources (Kakerissa & Hahury, 2022). Historically, Ambon's role as a maritime trading hub has laid a strong foundation for the growth of industries based on fishery resources.

As global demand for tropical fishery products, particularly tuna and large pelagic species continues to rise, Ambon faces a significant opportunity to strengthen its position within the global value chain. The existence of the frozen fish industry serves as an essential instrument to maintain export quality and extend product shelf life, thus meeting international quality standards. Nevertheless, these opportunities have not been fully matched by the region's ability to optimize value addition at the local level (Kakerissa et al., 2024). Most of the economic value remains concentrated at the downstream segment of the supply chain, particularly in the hands of exporters and external buyers, while fishermen and small-scale industries in Ambon operate with limited bargaining power.

The fundamental challenge faced by the frozen fish industry in Ambon Island lies in the lengthy and inefficient value chain structure. Dependence on external suppliers, high inter-island logistics costs, and limited cold-chain infrastructure are key factors hindering competitiveness. In this context, value chain analysis becomes a vital tool to understand how product, information, and economic value flows are structured and how local actors' positions can be strengthened within them. The concept of the value chain provides an effective strategic instrument for analyzing and organizing organizational operations (Friedrichsene & Mühl-Benninghaus, 2013). This notion is supported by Bandason (2022), who emphasizes that value chains are essential tools for stakeholder collaboration, market access expansion, foreign currency generation, and production enhancement in most developing countries. According to Straková et al. (2020), value chain analysis is a tool for understanding activities that create business value and helps firms improve their competitive advantage by identifying areas for cost reduction or differentiation.

Furthermore, the dynamics of institutional relations play a crucial role. Buyers and exporters from outside the region, particularly those based in Surabaya, possess significant power in determining prices, quality standards, and supply volumes. Conversely, fishermen and local industries tend to occupy structurally dependent positions within established contractual systems and distribution networks. Such governance imbalances often lead to value leakage, where economic value flows out of producing regions toward external processing and export centers beyond Maluku.

On the other hand, local governments and inflation control agencies are working to maintain a balance between export interests and domestic market needs. Policies requiring industries to allocate a portion of their production for local consumption reflect an effort to ensure both economic and social sustainability at the regional level. However, the effectiveness of these policies still depends on the synergy among actors within the value chain, including the government's role in providing infrastructure, logistics facilitation, and transparent market information systems.

This paper seeks to address two key questions: (1) how the frozen fish value chain in Ambon Island is structured and functions within regional and global economic contexts, and (2) to what extent improvements in the value chain system can sustainably strengthen the competitiveness of local fisheries industries. Through this approach, the study aims to provide a deeper understanding of Ambon's strategic position within the global fisheries value chain and to open opportunities for formulating upgrading strategies toward inclusive and sustainable competitiveness, beyond the ice.

2. METHODS

This study employs a Value Chain Analysis (VCA) approach to identify the structure of actors, product flows, and value-added distribution within the frozen fish industry in Ambon Island. This approach allows for tracing the relationships among actors along the upstream-to-downstream continuum and assessing their implications for regional competitiveness.

The research utilizes both primary and secondary data. Primary data were collected through field observations and semi-structured interviews with fishermen, suppliers, frozen fish industry managers, retail traders, and representatives from local government institutions. Secondary data were obtained from official reports published by the Maluku Provincial Marine and Fisheries Office, the Ministry of Marine Affairs and Fisheries (2023), and BPS statistical publications (2024).

The analytical process was carried out in four stages: (1) Identification of actors and product flows along the value chain; (2) Computation of value added through comparison of prices and costs at each distribution stage; (3) Governance analysis to examine the dominance and contractual relationships among actors; and (4) Interpretation of implications for competitiveness, particularly in relation to distribution efficiency and connectivity with export markets.

Validation was conducted through data triangulation, by cross-verifying information from interviews, field observations, and official documents to ensure the consistency and reliability of findings.

3. RESULT AND DISCUSSION

a. *Structure of the Frozen Fish Value Chain in Ambon*

The frozen fish value chain in Ambon Island consists of five key actors: fishermen, suppliers, frozen fish processing industries, retail traders, and buyers/exporters. Each actor performs a specific and interdependent role that collectively sustains the functioning of the industry: (1) Fishermen serve as the primary producers, catching both large and small pelagic fish. Their catch volume fluctuates seasonally due to changes in weather and fishing conditions; (2) Suppliers function as aggregators, collecting fish from various fishermen and providing a consistent raw material supply to processing industries through stable contractual relationships; (3) Frozen fish processing industries form the central node of value addition, responsible for cleaning, freezing, and packaging fish to meet export and domestic market standards; (4) Retail traders distribute processed fish to local markets and have a substantial role in determining retail prices, particularly during the lean fishing season when supply becomes limited; (5) Buyers and exporters, primarily located in Surabaya, dominate the export chain and exert control over pricing, quality standards, and market access. The overall relationship among these actors within the frozen fish industry in Ambon Island is illustrated in Figure 1.



Figure 1. Key Actors in the Frozen Fish Industry of Ambon Island

The flow of frozen fish products follows two main distribution channels: (1) Direct channel, approximately 40% of the total catch is delivered directly from fishermen to processing industries; (2) Indirect channel – the remaining 60% is supplied through permanent suppliers who act as intermediaries for the industries. After processing, the industries distribute their final products through three main destinations: about 80% to export markets via buyers in Surabaya, 15% to local retail traders, and 5% directly to local consumers. The overall product distribution flow of the frozen fish value chain in Ambon Island is depicted in Figure 2.

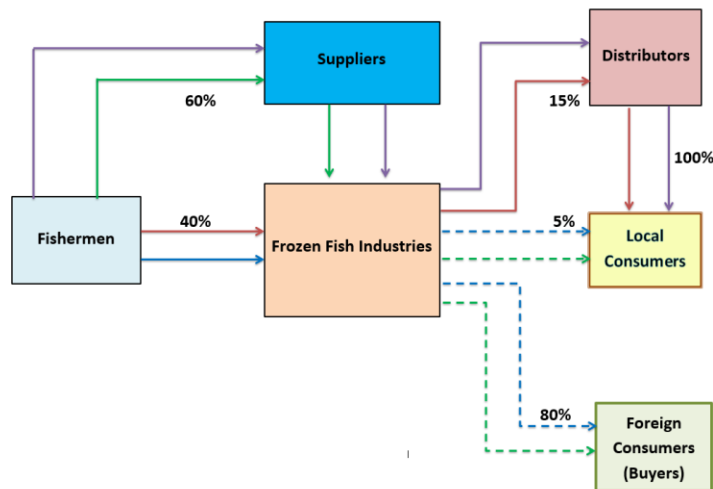


Figure 2. Frozen Fish Industry Value Chain Map on Ambon Island

The value chain map illustrates the interaction among key actors involved in the frozen fish industry in Ambon Island, capturing the dual distribution structure (direct and indirect channels) and the governance relationship between local producers and external buyers.

b. Value Added and Distribution Efficiency

Within the frozen fish value chain in Ambon Island, the costs incurred and the selling prices received by each actor remain relatively constant across all marketing channels. This cost and price structure reflects the stability of contractual relationships among fishermen, suppliers, freezing industries, and traders.

The average costs incurred and the average prices received per kilogram of fish are compared between two major commodity groups, large pelagic fish and small pelagic fish. Through this comparison, the contribution of value added at each stage of distribution and the level of supply chain efficiency for each product type can be identified.

The analysis of value added within the frozen fish industry value chain in Ambon Island reveals notable differences between large pelagic fish (Figure 3a) and small pelagic fish (Figure 3b), both in terms of cost structure, profit margins, and distribution efficiency among actors.

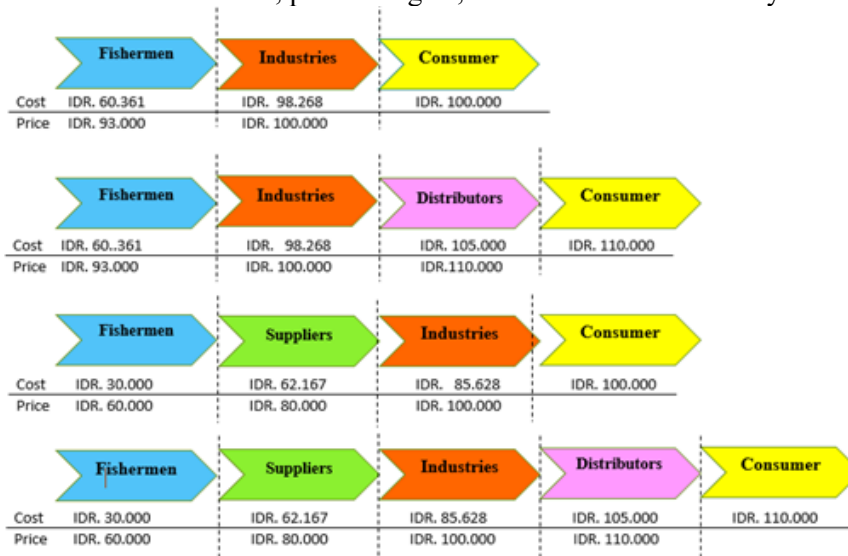


Figure 3a. Mapping the Value of Large Pelagic Fish

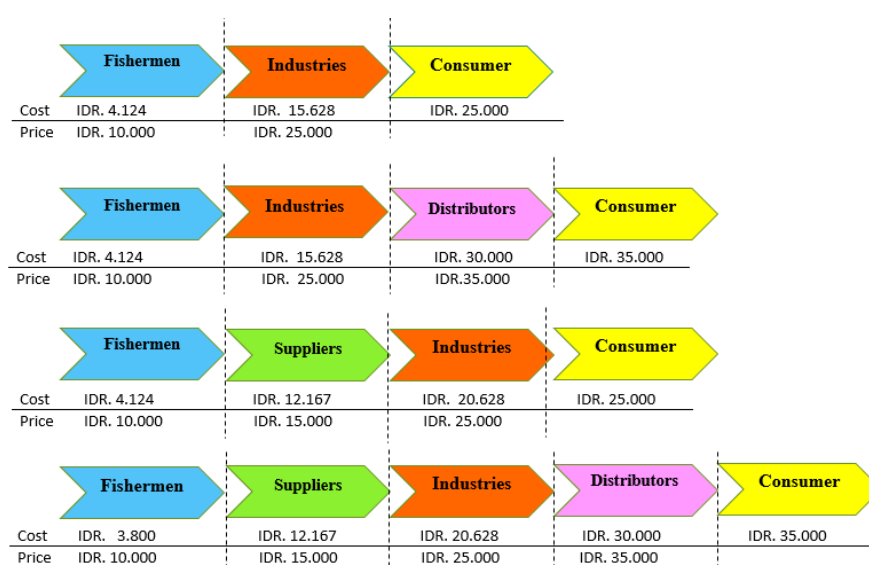


Figure 3b. Mapping the Value of Small Pelagic Fish

For large pelagic fish, production costs at the fisher level range between IDR 30,000–60,361 per kilogram, while the selling price to processing industries varies depending on the distribution channel. In the direct channel (fishermen–industry–consumers), industries procure raw materials at a lower price (around IDR 60,000/kg) and sell the final frozen products at approximately IDR 100,000/kg. In contrast, along the indirect channel, which involves suppliers and distributors, the procurement cost of raw materials increases up to IDR 80,000/kg, with the final consumer price reaching IDR 110,000/kg.

Differences in margins across distribution channels indicate that the longer the value chain, the greater the accumulation of value added at the downstream level, particularly among distributors and buyers. However, this does not necessarily reflect improved efficiency. The direct channel involving fishermen and processing industries has proven to yield relatively higher profit margins for local actors, while reducing transaction costs and quality degradation caused by prolonged storage and handling time. Hence, the direct channel is considered more efficient and provides greater economic contribution to local stakeholders.

For small pelagic fish, production costs are considerably lower, averaging IDR 4,124/kg, with the selling price to processing industries around IDR 10,000/kg. The distribution pattern follows a similar trend: the greater the number of intermediaries, the higher the consumer price, rising from IDR 25,000/kg in the direct channel to IDR 35,000/kg in the channel involving suppliers and distributors. Nevertheless, the profit margin received by fishermen remains relatively small, at approximately IDR 5,000–6,000/kg, indicating a significant inequality in the distribution of value added along the small pelagic fish value chain.

These findings reinforce the argument that value chain efficiency is highly dependent on the length of the distribution channel and the contractual relationships among actors, where effective distribution management not only enhances the flow of products but also creates a competitive advantage for all partners across the network through shorter delivery times and greater product availability (Andjelkovic & Radosavljevic, 2020). Frozen fish processing industries capture the largest share of value added, primarily due to their capacity to process, store, and export products that meet international quality standards. Conversely, fishermen occupy the weakest bargaining position, as they lack direct access to export markets and remain dependent on prices determined by suppliers or buyers.

Overall, the structure of value creation in Ambon's frozen fish industry suggests that strengthening the local value chain through shorter distribution channels (direct linkages) and the institutional empowerment of fishermen could significantly enhance efficiency and competitiveness. Optimizing cold chain logistics, ensuring price transparency, and developing

policy incentives for industries that directly source fish from fishermen can serve as key strategies to promote sustainable economic growth within this sector.

c. Governance and Institutional Relations in Ambon's Frozen Fish Value Chain

The governance of the frozen fish value chain in Ambon Island is shaped not only by market mechanisms but also by power relations among actors and institutional configurations that structure economic interactions along the supply chain. Buyers and exporters based in Surabaya occupy strategic positions as the main price setters and quality standard enforcers, while local fishers and processors operate within a constrained bargaining space (Yıldırım, 2023).

These buyers and exporters have direct access to international markets and control national logistics and distribution networks (Virtanen et al., 2023; Mishrif et al., 2024). They define product specifications, such as size, freshness, and freezing methods in line with the requirements of export destinations including Japan, China, and Korea. The concentration of market power outside Ambon has created strong dependence among local freezing industries on partnership contracts and payment systems governed by buyers. Consequently, value added captured upstream by fishers and local processors remains significantly lower than the export value accrued downstream (Wiranthi et al., 2024; Nasr-Allah et al., 2019; Wibowo et al., 2025).

At the same time, local fishers and processors face persistent structural constraints, including limited access to working capital, market information, and cold storage facilities. During periods of abundant catch, they often sell below production costs due to insufficient storage capacity. This condition reinforces the dominance of suppliers or collectors, who function as key intermediaries linking fishers to processing industries while controlling both supply flows and local prices.

Similar dynamics were observed in Amazonian fishing communities studied by Bartkus et al. (2022), where middlemen dominance generated structural dependency and depressed fisher incomes. The study demonstrated that cooperative-based institutional interventions enabled communities to bypass middlemen, significantly increasing both prices received and overall income. Strengthening fisher institutions and fostering collective investment, therefore, represent promising strategies to enhance efficiency and equitable value distribution within Ambon's fisheries.

These local dynamics also resonate with broader global trends of financialization **and** ocean grabbing, as illustrated by Knott and Neis (2017) in their study of herring fisheries and intensive aquaculture in New Brunswick, Canada. They showed how neoliberal processes, including privatization, marketization, vertical integration, and globalization have transformed small-scale, family-based fisheries into corporate, financialized sectors. Such processes shift control over marine resources from local communities to corporate entities, deepening asymmetries of power and access within coastal economies.

Comparing these contexts reveals that Ambon's frozen fish value chain stands at a critical juncture: it can either strengthen local institutional capacities to foster economic self-reliance or follow the global trajectory in which liberalization and market integration further widen the gap between small-scale actors and large capital holders.

In the domestic market, retailers also play an influential role, particularly during supply fluctuations caused by lean seasons or delays in product distribution. Under such conditions, retail prices can rise sharply, exposing inequities in value distribution along the chain. This highlights that local price governance remains highly vulnerable to supply shocks and is not yet governed by efficient market mechanisms.

The regional government, through the *Regional Inflation Control Team* (TPID), acts as a corrective institution balancing export orientation with domestic food security. Policies mandating each freezing industry to allocate at least 10% of its output for the domestic market have been instrumental in ensuring product availability and stabilizing prices. In practice, most firms allocate up to 20% as reserve stock during lean fishing periods.

Nevertheless, the effectiveness of such institutional mechanisms depends on inter-agency coordination, transparent price monitoring systems, and the commitment of private actors to support stabilization efforts without undermining export competitiveness. Overall, Ambon's frozen fish value chain reflects a complex interplay between global market pressures and local regulatory interventions, two opposing yet interdependent forces shaping the region's future fisheries competitiveness.

d. Key Challenges

The analysis reveals at least two major structural challenges that continue to constrain the optimization of value addition and competitiveness of the frozen fish industry in Ambon Island. First, high logistics costs remain one of the most persistent obstacles across the value chain, particularly within inter-island distribution systems and cold storage infrastructure. The cost of transporting frozen fish from Ambon to major trading hubs such as Surabaya or Jakarta accounts for a significant portion of the total production cost. Freight and handling charges are further exacerbated by limited container availability and the high cost of energy required for maintaining the cold chain. Cold storage capacity at landing sites and industrial zones is still inadequate to handle large volumes during peak harvest seasons, resulting in product oversupply, premature sales at discounted prices, or even quality deterioration. The absence of an integrated cold chain from landing ports, processing plants, to export terminals, reduces the overall efficiency of the supply network and undermines product competitiveness in both domestic and export markets.

This logistical constraint reflects a broader structural weakness in eastern Indonesia's maritime connectivity, where transportation infrastructure has not kept pace with the expansion of production capacity. In this context, investment in cold chain logistics, inter-island shipping efficiency, and port modernization is crucial. Strengthening institutional coordination between the Ministry of Marine Affairs and Fisheries, port authorities, and local governments could help integrate logistics planning into regional industrial development strategies. Furthermore, the introduction of digital traceability systems and shared cold storage facilities may serve as cost-effective solutions to enhance product quality assurance and market reliability (Villalobos et al, 2019; Teniwut, 2020; Kakerissa, 2025).

Second, the industry remains heavily dependent on a single group of buyers and exporters located outside Ambon. This buyer concentration, primarily in Surabaya, creates a highly asymmetric market structure in which price formation and product specifications are dictated by external actors. Such dependence exposes local processors to global demand shocks and price volatility, particularly from key export destinations such as Japan, China, and South Korea. When global demand declines or quality standards shift, the impact is immediately transmitted to Ambon's producers, who lack alternative domestic or regional market networks.

This structural dependency has resulted in limited bargaining power for local firms and a lack of incentives for innovation or product diversification. The dominance of external buyers reinforces a pattern of value lock-in, where local actors remain confined to low-value segments of the chain, primarily as raw material suppliers without capturing the downstream benefits associated with processing, branding, or export marketing. In the long term, such a structure risks perpetuating economic dependency and inhibiting industrial upgrading (Lin & Wang, 2020).

Addressing this challenge requires a dual strategy of market diversification and institutional empowerment. On the one hand, promoting access to domestic and regional markets, such as inter-island trade within Maluku, Papua, and Sulawesi could help absorb production surpluses

and reduce exposure to export volatility. On the other hand, developing collective marketing institutions, such as fisher cooperatives or producer associations, would enhance negotiation capacity and facilitate direct trade linkages. Policy incentives that support direct linkage schemes between fishermen and processors, along with financing instruments tailored for small-scale enterprises, could further strengthen the resilience of the local value chain.

Finally, both challenges, logistics inefficiency and buyer dependency reflect the broader issue of institutional fragmentation in the governance of the marine economy. Current regulatory and support mechanisms remain sectorally divided, limiting the ability to coordinate investment in infrastructure, trade facilitation, and capacity building. A more integrated approach that combines industrial policy, spatial planning, and social protection for small-scale fishers is needed to achieve sustainable value chain upgrading. In this sense, the Ambon frozen fish industry stands at a strategic crossroads: whether to remain within a dependency-driven export model or transition toward a more inclusive, locally anchored, and innovation-based maritime economy.

e. Implications for Competitiveness

An efficient value chain structure has a direct correlation with price competitiveness and industrial sustainability. Optimizing direct linkages between fishermen and processing industries can reduce the number of distribution layers and minimize transaction costs, thereby increasing profit margins at the producer level while lowering prices in end markets. Such efforts also have the potential to improve the fairness of value sharing mechanisms among actors across the supply chain.

Beyond structural efficiency, achieving sustainable competitiveness requires market diversification and greater transparency in partnership arrangements. The establishment of interregional trade networks across Eastern Indonesia, such as with Bitung, Ternate, or Sorong could reduce dependence on a single export route through Surabaya. Strengthening an integrated cold logistics system across these regions is also a critical prerequisite to maintaining product quality and expanding market reach.

In the future, Ambon holds significant potential to strengthen its position within the global value chain through the digitalization of supply chain systems and the development of a traceability system that enables product tracking down to the fisher level. This initiative not only enhances the trust of export markets but also paves the way for developing a geographical branding identity, such as “Ambon Frozen Fish,” symbolizing quality and sustainability. According to Khan et al. (2025), the adoption of Industry 4.0 technologies can accelerate this transformation. IoT-based cold chain monitoring systems allow for real-time temperature control and product tracking from the point of capture to export, ensuring freshness and full traceability. Blockchain technology can strengthen transparency and trust among fishers, processors, and buyers by securing transaction data and verifying product origin. Predictive analytics and AI-driven logistics optimization can reduce transportation inefficiencies, minimize waste, and lower carbon footprints. Moreover, digital value chain platforms provide small-scale fishers with broader access to market information, enabling them to negotiate fairer prices while promoting inclusivity and equitable value distribution across the supply chain.

Therefore, enhancing the competitiveness of Ambon’s frozen fish industry requires a comprehensive and integrated approach that encompasses logistical efficiency, market independence, digital innovation, and inclusive partnership governance. This transformation will determine the extent to which Ambon can move beyond the ice, from merely a raw material supplier to a strategic value node within Indonesia’s blue economy.

4. CONCLUSION

The frozen fish industry in Ambon Island represents the dynamic yet fragile face of coastal economic transformation. A value chain analysis reveals that the region’s abundant marine resources have not been fully converted into substantial added value for local actors. Long distribution chains, high logistics costs, and dependence on external buyers are the main factors constraining the industry’s competitiveness at a mid-level stage.

The dominant role of buyers and exporters based in Surabaya in determining prices and quality standards places local fishers and processors in a weak bargaining position. At the same time, local retailers serve as crucial actors in the domestic market, particularly during periods of supply scarcity. Amid this structural imbalance, the Regional Inflation Control Team (Tim Pengendali Inflasi Daerah, TPID) functions as an institutional mechanism to maintain equilibrium between export interests and local food security needs. However, its effectiveness still depends on cross-agency coordination and the willingness of industry players to commit to stabilizing domestic supply.

Findings from this study affirm that competitiveness is not solely determined by cost efficiency but also by equitable, transparent, and integrated value chain governance. Strengthening direct linkages between fishers and freezing industries could shorten distribution channels and enhance welfare at the upstream level. Likewise, improving cold-chain logistics infrastructure and diversifying export markets represent strategic measures to reduce dependence on a single dominant buyer.

Furthermore, implementing a digital value chain and traceability system will reinforce the credibility of Ambon's fish products in global markets while creating opportunities for the establishment of a geographic branding identity that emphasizes quality and sustainability. Through this approach, Ambon has the potential not only to serve as a fisheries distribution hub for Eastern Indonesia but also as a model of inclusive and adaptive value chain management responsive to global market dynamics.

Thus, moving beyond the ice entails driving structural transformation—from a volume-based economy toward a value-based one. This transition requires strong synergy among local governments, industry stakeholders, financial institutions, and fishing communities to build a competitive, sustainable, and equitable fisheries ecosystem.

ACKNOWLEDGEMENTS

We would like to express our gratitude to all stakeholders, fishermen, and frozen fish consumers for their cooperation in providing information and answering the questions we have disseminated. This research would not have been possible without the valuable information contributed by the individuals who responded to the questionnaire. Thank you to all parties for your support.

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