



## Export Handling Procedures for Perishable Fish Commodities Via Air Freight at PT. XYZ

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### Abstract

Freight forwarding services play a critical role in coordinating multi-modal shipments, managing logistics documentation, and ensuring time-sensitive delivery of perishable commodities. This study analyzes the export handling procedures for perishable fish commodities shipped via air freight at PT XYZ, a specialized freight forwarder operating near Soekarno-Hatta International Airport. Employing a qualitative descriptive method with a single case study design, data were collected through in-depth interviews with two supervisors and three operational staff, direct observation, and documentation review, validated through source and method triangulation. Findings reveal a structured 13-stage export procedure from order receipt to aircraft build-up that must be completed within a 4–6 hour closing-time window. Five operational constraints were identified: (1) delayed commodity information from exporters; (2) human error in document input; (3) external system failures (Badan Karantina Ikan and INSW); (4) cargo space limitations on commercial aircraft, identified as the most dominant constraint based on interview data; and (5) destination-country regulatory complexity. Applying Fishbone Analysis, root causes were traced to five dimensions human, method, machine, material, and environment and targeted strategic recommendations were formulated for each. This study contributes an empirically grounded procedural and analytical framework for perishable fish export logistics, offering practical implications for freight forwarders, airline cargo managers, and export policy stakeholders in Indonesia.

**Keywords:** Export, Perishable Goods, Freight Forwarder, Fishbone Analysis, Air Cargo, Cold Chain

## 1. INTRODUCTION

Intensifying global trade has heightened demand for reliable, time-sensitive logistics systems, particularly for perishable commodities that are highly vulnerable to quality degradation. Indonesia, as the world's largest archipelagic nation and Southeast Asia's most expansive maritime territory, holds enormous marine resource potential. The Ministry of Marine Affairs and Fisheries (KKP) estimates Indonesia's marine resource potential at IDR 19.6 trillion per year, spanning fisheries, maritime tourism, shipping, and trade [1].

The fisheries sector contributes 2.59% to Indonesia's Gross Domestic Product (GDP), with export volumes reaching 1.22 million tons valued at USD 6.24 billion in 2022. The United States and China absorb 37.63% and 17.90% of total export value, respectively [2]. Despite this scale, the global competitiveness of Indonesian fisheries products remains negative (–85.97%), underscoring the urgent need to improve handling quality and logistics efficiency [3].

Fish is inherently perishable and susceptible to rapid quality deterioration when cold-chain integrity is compromised. Air freight is the dominant mode for perishable fish exports due to its significantly shorter transit time compared to sea freight a critical advantage for maintaining freshness and market value. However, air cargo logistics for perishable commodities present distinct operational challenges, including strict time windows, documentation complexity, cargo space competition, and multi-agency regulatory requirements [6], [10].

Research on perishable export logistics in Indonesia has predominantly focused on port-based sea freight [7], [13], [14], with comparatively limited attention to the procedural and analytical dimensions of air freight



operations for fish commodities. Existing studies such as Antika and Febrianto [10] identified general air export barriers (incomplete documents, inaccurate cargo information, oversized cargo), while Adriana [13] examined perishable fruit and vegetable handling, leaving fish-specific air freight procedures at specialized freight forwarders underexplored. No prior study has systematically linked each procedural stage with its associated operational constraints, applied Fishbone Analysis to root-cause identification in this context, or proposed structured strategic recommendations grounded in field evidence. This study addresses that gap through a detailed, evidence-based case study of PT XYZ a high-volume fish exporter processing approximately 100 tons per day near Soekarno-Hatta International Airport.

Cold-chain vulnerability is a central concern in perishable air logistics. Improper temperature management, handling delays, or documentation errors can result in spoilage, shipment rejection, or financial loss risks that are amplified during peak seasons when cargo space becomes severely constrained [6], [19]. Airport cargo bottlenecks, including limited cargo hold availability on commercial passenger aircraft and variable closing times across airlines, further compound operational risk [22]. These systemic challenges are insufficiently documented in the Indonesian freight forwarding literature, representing both a theoretical gap and a practical problem for the industry.

This study therefore pursues three objectives: (1) to describe in detail the 13-stage export handling procedure for perishable fish commodities via air freight at PT XYZ; (2) to identify and analyze the operational constraints and barriers encountered at each stage; and (3) to formulate structured strategic recommendations using Fishbone Analysis, grounded in empirical field evidence.

## **2. LITERATURE REVIEW**

### **2.1 Freight Forwarding in Export Logistics**

A freight forwarder acts as an intermediary between exporters/importers and transportation service providers, coordinating multi-modal shipments and managing end-to-end logistics. Core functions include export-import documentation, cargo space booking, customs processing, cargo insurance, and shipment oversight from origin to destination [4]. Hidayat [5] emphasizes that freight forwarders also issue House Airwaybills (HAWBs) and coordinate all supply chain parties to ensure seamless delivery. In the context of perishable exports, the freight forwarder's role is particularly critical given the time pressure and regulatory complexity involved.

### **2.2 Perishable Goods and Cold Chain Requirements**

Perishable goods are commodities that undergo rapid quality deterioration without precise environmental control [6]. Fish products fall into this category and are classified into three types: fresh fish (recently deceased), frozen fish, and live fish each with different sensitivity levels but all requiring fast, temperature-controlled handling throughout the supply chain [7]. The International Air Transport Association (IATA) Perishable Cargo Regulations define specific protocols for packaging, temperature maintenance, handling time, and aircraft loading for perishable shipments. Cold-chain integrity from farm/catch point to destination is a prerequisite for market acceptance and regulatory compliance [6].

### **2.3 Export Procedures and Documentation**

Export procedures encompass a sequence of administrative and operational steps required to transfer goods from Indonesia's customs territory to the destination country. For perishable fish exports via air, the core documents include: Airwaybill (AWB), Export Declaration (Pemberitahuan Ekspor Barang/PEB), Export Service Note (Nota Pelayanan Ekspor/NPE), Invoice, Packing List, and Health Certificate issued by the Fish Quarantine Authority (Badan Karantina Ikan). Depending on the destination, a Certificate of Origin (COO) may also be required [8], [9]. Document accuracy and timeliness are critical, as errors trigger delays that may cause exporters to miss airline closing times resulting in cargo rescheduling, quality degradation, or shipment cancellation.

### **2.4 Air Freight for Perishable Commodities**

Air freight is the preferred mode for perishable fish exports due to transit times as short as 12 hours. However, most fish exports utilize the belly cargo hold of commercial passenger aircraft rather than dedicated freighters, creating direct competition with passenger baggage for limited space [6], [10]. During peak seasons, this competition intensifies significantly, leading to cargo offloading, delayed shipments, and



potential spoilage. Cargo space availability is therefore identified in the literature as a critical bottleneck for perishable air freight success [19]. The packaging chain typically styrofoam boxes, plastic liners, and cardboard must maintain temperature integrity throughout loading, transit, and unloading without active refrigeration during flight.

## 2.5 Fishbone Analysis in Logistics

Fishbone Analysis (Ishikawa Diagram) is a structured causal analysis tool that categorizes root causes of operational problems into five dimensions: human (Man), work method (Method), machine/equipment (Machine), material (Material), and environment (Environment) [11], [12]. In logistics and operations management, it enables systematic problem diagnosis and supports the formulation of targeted improvement strategies. This study applies Fishbone Analysis to categorize the root causes of each identified constraint and link them to empirical evidence from field data.

## 2.6 Related Studies

The research gap is clear: no prior study has combined a stage-by-stage procedural analysis of fish air freight at a specialized Indonesian freight forwarder with empirically grounded Fishbone Analysis and strategic recommendations. This study fills that gap.

Table 1. Summary of Related Studies

| Author & Year                   | Research Object                | Method                      | Key Findings                                                                                                            |
|---------------------------------|--------------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Adriana (2014) [13]             | PT MSA Kargo Surakarta         | Qualitative case study      | Perishable export (fruits & vegetables) via air; constraints: no cold storage at airport, limited international flights |
| Hidayat (2011) [5]              | ASA Cargo Surakarta            | Case study & field practice | Sea freight export stages; constraint: crowded departure schedules                                                      |
| Danilwan & Panjaitan (2023) [4] | PT Bahari Eka Nusantara        | Observation & interview     | Freight forwarder roles in import/export; solution for vessel schedule uncertainty                                      |
| Antika & Febrianto (2023) [10]  | FF Company, Tangerang          | Two-stage                   | Air export barriers: incomplete documents, inaccurate cargo info, oversized cargo                                       |
| Kumariani et al. (2024) [14]    | PT Ardana Sejahtera Abadi      | Qualitative descriptive     | FCL salak fruit export; constraint: stuffing delay due to reefer container generator                                    |
| Soon et al. (2024) [17]         | Food trading company, Malaysia | Mixed method                | Late document submission is key driver of export delivery failure; recommends automated reminder systems                |
| Desidera et al. (2018) [18]     | PT Puninar MSE Indonesia       | Descriptive analytical      | HAWB errors mostly caused by human error; result in delays and additional revision workload                             |

## 3. METHODOLOGY

This study adopts a qualitative descriptive approach with a single case study design [15], [16]. A case study is appropriate here because the study aims to understand, in depth, how export handling procedures operate in a real organizational context including the constraints and causal dynamics that cannot be captured through large-scale surveys.

### 3.1 Research Site and Subject

The research site is PT XYZ, a freight forwarding company specializing in perishable fish export via air freight, located in Cengkareng, West Jakarta, adjacent to Soekarno-Hatta International Airport. The company was selected purposively based on its high export volume (approximately 100 tons of fish per day), specialization in perishable cold-chain logistics, and accessibility for field observation.

### 3.2 Data Collection

Data were collected through three complementary techniques:



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- In-depth interviews: Five respondents were interviewed, selected using purposive sampling based on their direct operational involvement. Respondents included two operations supervisors (with >5 years experience in air freight perishable handling) and three operational staff from the documentation, trucking, and acceptance divisions. Interviews were conducted in semi-structured format, with each session lasting 45–90 minutes, recorded with consent, and transcribed verbatim.
- Direct observation: Field observations were conducted over four working days across all 13 procedural stages, from order receipt through aircraft build-up. Observations covered document processing, cargo handling, quarantine inspection, X-ray screening, weighing, and acceptance procedures.
- Documentation review: Company operational documents were reviewed, including sample Airwaybills, PEB submissions, Health Certificates, NPE records, and internal standard operating procedure (SOP) drafts.

### 3.3 Validation: Triangulation

Data validity was ensured through triangulation at two levels: (1) source triangulation cross-checking data from different respondents (supervisors vs. operational staff) to identify convergence or divergence; and (2) method triangulation comparing findings from interviews, observations, and documents to confirm consistency. Discrepancies were resolved through follow-up clarification with respondents.

Table 2. Data Sources, Respondents, and Validation Steps

| Data Source          | Respondents/Materials                                                    | Validation Step                                   |
|----------------------|--------------------------------------------------------------------------|---------------------------------------------------|
| In-depth interview   | 2 supervisors, 3 operational staff (documentation, trucking, acceptance) | Source triangulation across respondents           |
| Field observation    | All 13 procedural stages observed over 4 working days                    | Cross-checked with interview data                 |
| Documentation review | AWB samples, PEB, Health Certificate, NPE, SOP drafts                    | Method triangulation with interview & observation |

### 3.4 Data Analysis

Data analysis followed three stages: (1) data reduction selecting and condensing field data relevant to procedures, constraints, and causal factors; (2) data display presenting findings in structured tables and procedural flowchart; and (3) conclusion drawing synthesizing patterns into procedural descriptions, constraint categorizations, and Fishbone-based strategic recommendations. The Fishbone Analysis framework structured the causal diagnosis, with each root cause explicitly linked to interview quotes, observations, or document evidence.

## 4. RESULTS AND DISCUSSION

### 4.1 Company Profile: PT XYZ

PT XYZ is a freight forwarder established in 2011 and operating in Cengkareng, West Jakarta, adjacent to Soekarno-Hatta International Airport. The company specializes in perishable goods export particularly fish via air freight, handling approximately 100 tons of fish per day. Airline partners include Garuda Indonesia, Cathay Pacific, Etihad, and Emirates, selected based on destination country. China is the primary export destination, followed by other markets in Asia, the Americas, and Europe. The company provides end-to-end logistics services including export-import handling, documentation, warehousing, trucking, and customs clearance.

Table 3. PT XYZ Company Profile

| Aspect                | Details                                                                     |
|-----------------------|-----------------------------------------------------------------------------|
| Year established      | 2011                                                                        |
| Location              | Cengkareng, West Jakarta (adjacent to Soekarno-Hatta International Airport) |
| Specialization        | Perishable goods export (fish) via air and sea freight                      |
| Daily export capacity | ±100 tons of fish per day                                                   |



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| Aspect                        | Details                                                        |
|-------------------------------|----------------------------------------------------------------|
| Fish types handled            | Fresh fish, frozen fish, live fish                             |
| Primary destination countries | China, and various countries in Asia, the Americas, and Europe |
| Airline partners              | Garuda Indonesia, Cathay Pacific, Etihad, Emirates, and others |
| Maximum delivery time         | 12 hours to destination country                                |

## 4.2 Export Handling Procedure: 13 Stages

- Based on triangulated data (interviews, observation, and documentation), the export handling procedure at PT XYZ consists of 13 sequential, time-critical stages. The entire process must be completed within a 4–6 hour closing time window imposed by the airline. The following describes each stage analytically, including its operational logic, time constraints, and linkages to subsequent stages.
- Stage 1 Order Receipt from Exporter: The exporter contacts PT XYZ to engage export handling services. PT XYZ conducts an initial verification of exporter legality (export license), commodity type, and destination country. Exporters lacking documentation may be referred to partner agencies for assistance. This stage sets the legal and informational foundation for all subsequent document processing.
- Stage 2 Submission of Invoice and Packing List: The exporter submits the Invoice and Packing List, which serve as the basis for document preparation. The Packing List contains commodity name, volume, quantity, and party addresses; the Invoice provides pricing and quantity verification. The accuracy and timeliness of these documents are critical delays or errors here cascade across all downstream stages.
- Stage 3 Cargo Space Booking (Airline): PT XYZ books cargo space on an airline aligned with the exporter's preferred schedule. Upon confirmation, the airline provides an Airwaybill number as proof of reservation. Cargo space availability is the most operationally constrained stage, particularly during peak seasons when competition with passenger baggage is intense.
- Stage 4 Airwaybill Issuance: PT XYZ issues the Airwaybill (AWB) based on the airline-assigned number. The AWB contains complete cargo details, shipper and consignee identities, and carriage terms. Document preparation takes approximately 20–25 minutes. Accuracy at this stage is critical as AWB data feed directly into quarantine, customs, and acceptance processing.
- Stage 5 Commodity Pickup by Trucking Division: Concurrent with document preparation, PT XYZ's Trucking & Delivery Division collects the commodity from the exporter's premises and transports it to the airport. Alternatively, exporters may deliver directly. The synchronization of trucking and documentation timelines is operationally important to avoid warehouse waiting time that could degrade fish quality.
- Stage 6 Quarantine Inspection and Health Certificate: Upon cargo arrival at the airport, PT XYZ files a quarantine application with Badan Karantina Ikan, submitting the Invoice, Packing List, AWB, and commodity samples. Inspection takes approximately one hour. A Health Certificate is issued upon successful inspection, confirming the fish is disease-free and fit for consumption. This certificate is a mandatory regulatory requirement for all fish export destinations.
- Stage 7 Export Declaration (PEB) Submission: PT XYZ, through a licensed customs service provider (PPJK), submits the PEB to the Directorate General of Customs and Excise via the Indonesia National Single Window (INSW) system. Required attachments include the PEB form, Packing List, Invoice, AWB, and Health Certificate. PEB submission triggers customs review and gateway processing.
- Stage 8 Export Service Note (NPE) Issuance: Upon PEB approval by customs, the NPE is issued, containing exporter identity, cargo data, NPE number, PEB reference, and inspection pathway. The NPE is the official export approval document from customs authorities and is prerequisite for subsequent airport processing stages.
- Stage 9 X-Ray Inspection by Regulated Agent: The cargo undergoes X-ray screening by the Regulated Agent (RA) to confirm the absence of dangerous or suspicious items. Upon clearance, the RA affixes a security seal to the consignment. This stage is mandated under aviation security regulations and is non-negotiable regardless of cargo type.
- Stage 10 Cargo Weighing and Weigh Certificate (BTB): Cargo is transported to the export warehouse, where the RA seal is opened and the consignment is weighed to determine actual weight. The resulting Bukti Timbang Barang (BTB) is used to finalize the AWB data. Actual weight may differ from the originally declared weight, triggering AWB amendment if necessary.



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- Stage 11 PEB and NPE Adjustment at Customs Gate: If cargo quantity changes from the original plan for example, a reduction from 10 boxes to 5 boxes due to quarantine rejection the PEB and NPE must be adjusted at the Customs Gate to reflect actual cargo status. This stage requires coordination between PT XYZ, the PPJK, and customs officers.
- Stage 12 Acceptance, Data Entry, and Electronic Data Transmission: At the airline acceptance area, a final document-to-cargo verification is conducted. Data are entered into the warehouse management system and transmitted electronically to the airline. This is the last validation checkpoint before loading, making accuracy here operationally critical.
- Stage 13 Build-Up and Document Distribution: The final stage involves loading the cargo onto the aircraft (build-up). The AWB typically in multiple copies for Shipper, Agent, Consignee, and Airline is distributed to all parties. Original documents are forwarded to the Consignee at the destination; PT XYZ retains soft copies for internal records. A transis invoice is sent to the exporter.

Table 4. Required Documents for Perishable Fish Export via Air

| No. | Document                  | Issuing Party              | Primary Function                                              |
|-----|---------------------------|----------------------------|---------------------------------------------------------------|
| 1   | Invoice                   | Exporter                   | Goods value and description                                   |
| 2   | Packing List              | Exporter                   | Volume, quantity, and weight detail                           |
| 3   | Airwaybill (AWB)          | PT XYZ / Airline           | Air transport document; booking proof and carriage terms      |
| 4   | Health Certificate        | Badan Karantina Ikan       | Sanitary certificate; confirms fish is disease-free           |
| 5   | PEB (Export Declaration)  | Exporter via PPJK          | Export notification to Customs and Excise                     |
| 6   | NPE (Export Service Note) | Customs and Excise         | Official export approval from customs authority               |
| 7   | BTB (Weigh Certificate)   | Airport Warehouse Operator | Actual weight data for AWB finalization                       |
| 8   | COO (optional)            | Authorized agency          | Origin certificate; required by certain destination countries |

The 13-stage procedure reflects a highly integrated logistics process in which each stage is both a prerequisite and a time constraint for the next. The 4–6 hour closing window imposes a sequencing discipline that leaves limited tolerance for delays at any stage. From a lead-time perspective, document preparation (Stages 2–4) occupies 20–25 minutes; quarantine inspection (Stage 6) takes approximately 60 minutes; and customs processing (Stages 7–8) may take 30–60 minutes depending on system availability. The cumulative critical path leaves approximately 60–90 minutes for trucking, X-ray, weighing, and acceptance a margin that is easily eroded by any single constraint.

#### 4.3 Operational Constraints and Analytical Discussion

Five operational constraints were identified through triangulated analysis of interview data, field observations, and documentary evidence. Each is analyzed below in terms of its stage impact, delay mechanism, and logistics implications.

- Constraint 1: Delayed Commodity Information from Exporters (Stage 2 Invoice & Packing List Submission)

When exporters fail to submit accurate Invoice and Packing List data on time, document preparation for all downstream stages AWB issuance, quarantine submission, and PEB filing is delayed. Since the closing time is fixed, a delay at Stage 2 compresses the available time for all subsequent stages, increasing the risk of missing the airline deadline. In the worst case, the entire shipment must be rescheduled to the next available flight, which may be 12–24 hours later a critical quality risk for fresh fish. This finding is consistent with Soon et al. [17], who identified late document submission as a key driver of export delivery failure, and with Antika & Febrianto [10], who found inaccurate cargo information to be a primary air export barrier.

- Constraint 2: Human Error in Document Input (Stage 4 AWB Issuance)



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- Data entry errors including incorrect consignee names, flight numbers, or AWB numbers create document inconsistencies that trigger rejection during acceptance screening or airline processing. While some errors are caused by staff carelessness, the majority originate from exporters providing unclear or incomplete information. Error correction requires additional coordination, delays the export timeline, and may trigger AWB amendment fees. Desidera et al. [18] reported similar findings, noting that HAWB errors caused by human error result in delays and additional revision workload. In PT XYZ's context, double-checking protocols are absent, creating a systematic vulnerability.
- **Constraint 3: External System Failures (Stages 6–7 Quarantine and PEB Submission)**  
PT XYZ depends on external digital systems specifically the Badan Karantina Ikan portal and the INSW system operated by Customs and Excise for quarantine certification and PEB processing. Technical failures in these systems prevent data input, document validation, and official issuance, with no direct workaround available since the systems are government-operated. Dalimunthe et al. [9] confirmed that INSW system failures are a known cause of NPE issuance delays. Because these disruptions are external and unpredictable, their impact on the export timeline is particularly difficult to mitigate without contingency manual procedures.
- **Constraint 4: Cargo Space Limitations on Commercial Aircraft (Stage 3 Cargo Space Booking)**  
Both supervisors identified cargo space limitation as the most frequently occurring and operationally dominant constraint. Commercial passenger aircraft carry fish in the belly hold, which must share limited space with passenger baggage. During peak seasons particularly Chinese New Year, end-of-year holidays, and high-demand periods in destination markets cargo hold availability drops sharply, forcing exporters to either accept rescheduled flights or cancel shipments. The operational impacts are multi-dimensional: (a) rescheduled shipments expose fresh fish to extended pre-flight holding time, accelerating quality degradation; (b) shipment cancellations result in financial losses for exporters and reduced service reliability for PT XYZ; (c) the inability to guarantee cargo space undermines exporter confidence, particularly for high-value live fish consignments. SIPMM Publications [19] identifies cargo space availability as a critical success factor for perishable air freight. The absence of historical data recording at PT XYZ prevents systematic seasonal forecasting, which represents a significant management gap.
- **Constraint 5: Destination-Country Regulatory Requirements (Cross-stage Documentation)**  
Export regulatory requirements vary significantly by destination country. India, for example, imposes strict import controls on Arowana fish (*Scleropages formosus*), which is listed under CITES (Convention on International Trade in Endangered Species) Appendix I, permitting trade only with specific documentation [20]. Several destination countries additionally require a Certificate of Origin (COO), which is not a standard document in PT XYZ's base procedure. Regulatory non-compliance results in shipment rejection at the destination, return costs, and potential penalties. The dynamic nature of regulatory requirements subject to policy changes makes ongoing compliance monitoring essential.

Table 5. Summary of Operational Constraints

| No. | Constraint                                   | Stage Affected                   | Key Impact                                                               | Frequency     |
|-----|----------------------------------------------|----------------------------------|--------------------------------------------------------------------------|---------------|
| 1   | Delayed exporter commodity information       | Stage 2 (Invoice & Packing List) | Cascading delay across all document stages; risk of missing closing time | Frequent      |
| 2   | Human error in document input                | Stage 4 (AWB Issuance)           | Document inconsistency; rejection at acceptance; revision costs          | Occasional    |
| 3   | External system failures (quarantine & INSW) | Stages 6–7 (Quarantine, PEB)     | Delayed issuance of official documents; timeline compression             | Intermittent  |
| 4   | Cargo space limitation on aircraft           | Stage 3 (Cargo Booking)          | Shipment rescheduling/cancellation; quality degradation; revenue loss    | Most frequent |
| 5   | Destination-country regulatory complexity    | Cross-stage (documentation)      | Document complexity; rejection risk at destination                       | Situational   |



#### 4.4 Fishbone Analysis and Strategic Recommendations

Fishbone Analysis was applied to trace the root causes of each constraint to one of five causal dimensions: human (Man), work method (Method), machine/equipment (Machine), material (Material), and environment (Environment). Root causes were identified from interview responses, field observations, and document review; each is linked below to its empirical source. Cargo space limitation (Material factor) was identified as the most dominant cause based on supervisor interview consensus and its multi-stage operational impact.

Table 6. Fishbone Analysis: Root Causes and Strategic Recommendations

| Dimension   | Root Cause (Evidence)                                                                                                                                                                                                         | Strategic Recommendation                                                                                                                                                                                                                                                                                                                 |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Human (Man) | Staff data entry errors in AWB; most errors traceable to unclear exporter-provided information (Interview: Supervisor A, field observation Stage 4)                                                                           | 1. Implement mandatory double-checking protocol before document submission 2. Develop automated data validator/scanning system 3. Establish regular staff training program on document input procedures for Documentation Division                                                                                                       |
| Method      | No formal SOP for exporter data submission deadlines; exporters submit information at inconsistent times (Interview: Supervisor B; Documentation review: no written SOP found)                                                | 1. Develop and enforce written SOP specifying deadline for exporter data submission relative to closing time 2. Implement automated reminder system (email/WhatsApp) to exporters with escalating urgency as deadline approaches                                                                                                         |
| Machine     | External system failures in Badan Karantina Ikan portal and INSW (Customs); PT XYZ has no direct control over these systems (Interview: both supervisors; observation: Stage 6–7 waiting periods)                             | 1. Establish direct communication channel with quarantine and customs IT support for real-time status updates during outages 2. Develop contingency manual procedure (SOP) for system-down conditions, pre-approved by relevant agencies                                                                                                 |
| Material    | Insufficient cargo space on commercial aircraft belly holds, especially during peak seasons; no historical data recording to predict high-demand periods (Interview: both supervisors identified as most dominant constraint) | 1. Implement systematic data recording of cargo space constraint frequency, affected flights, and seasonal patterns 2. Optimize cargo consolidation: combine compatible commodities (e.g., fresh fish + fresh crab) into single ULD units 3. Develop strategic partnerships with multiple airlines to ensure alternative routing options |
| Environment | Variable and changing import regulations across destination countries (e.g., CITES requirements for Arowana in India, COO requirements in other markets) (Documentation review; Interview: Supervisor A)                      | 1. Establish proactive monitoring system for regulatory updates from primary destination countries 2. Appoint or engage a dedicated export regulatory consultant (internal or external) to track policy changes and ensure compliance                                                                                                    |

Among the five dimensions, the Material factor (cargo space limitation) warrants the most urgent attention given its dominance, frequency, and multi-stage impact. Cargo consolidation combining shipments from multiple exporters of compatible commodities into a single Unit Load Device (ULD) is the primary recommended strategy. This approach simultaneously increases cargo space utilization, reduces per-unit shipping cost, and strengthens PT XYZ's negotiating position with airlines. For example, fresh fish and fresh crab share compatible temperature handling requirements and can be co-consolidated without quality compromise.

Systematic data recording is a prerequisite for evidence-based cargo management. Currently, PT XYZ does not maintain historical records of cargo space constraint occurrences. Building this data infrastructure would enable: (a) identification of peak-season patterns (e.g., Chinese New Year, national holidays in destination markets); (b) proactive pre-booking of cargo space weeks in advance for high-demand periods; and (c) data-driven route diversification across multiple airline partners.



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For the Human and Method dimensions, the absence of formal SOPs and double-checking protocols creates a structural vulnerability in document accuracy. The implementation cost of these interventions is low relative to the operational and reputational cost of AWB errors, making them high-priority, low-barrier improvements.

## 5. CONCLUSION

**Procedural Findings:** The export handling procedure for perishable fish commodities via air freight at PT XYZ consists of 13 sequential stages, from order receipt through aircraft build-up, that must be completed within a 4–6 hour airline closing window. Document preparation occupies 20–25 minutes; quarantine inspection approximately 60 minutes; and customs processing 30–60 minutes leaving a narrow operational margin that is highly sensitive to any delay. The seven core documents required (AWB, Invoice, Packing List, Health Certificate, PEB, NPE, BTB) must be processed in strict sequence, with each document serving as a prerequisite for the next stage.

**Constraint Analysis:** Five operational constraints were empirically identified: (1) delayed commodity information from exporters, which cascades across all document preparation stages; (2) external system failures in government-operated quarantine and customs platforms, over which PT XYZ has no direct control; (3) human error in document input, largely traceable to unclear exporter information and absent double-checking protocols; (4) cargo space limitation on commercial aircraft belly holds identified as the most dominant constraint, causing shipment rescheduling, quality degradation, and revenue loss particularly during peak seasons; and (5) destination-country regulatory complexity, which creates variable documentation requirements and compliance risk.

**Strategic Recommendations:** Fishbone Analysis produced five-dimensional strategic recommendations: (a) Human: mandatory double-checking protocols, automated data validation, and periodic staff training; (b) Method: formal SOP for exporter submission deadlines and automated reminder systems; (c) Machine: direct IT coordination channels with external agencies and contingency manual procedures; (d) Material: systematic recording of cargo constraint patterns, cargo consolidation (ULD optimization), and multi-airline partnership development; (e) Environment: proactive regulatory monitoring and dedicated compliance advisory.

**Managerial Implications:** For freight forwarders handling perishable fish, the critical managerial insight is that cargo space management is not merely a booking function it is a strategic logistics capability that requires data infrastructure, proactive airline relations, and consolidation expertise. The narrow time window of perishable air export operations demands that all five constraint dimensions be managed simultaneously, not reactively. For airline cargo managers, the finding that commercial belly-hold competition is the primary bottleneck for perishable exporters points to potential service differentiation opportunities, such as dedicated perishable cargo allocation or priority booking arrangements. For Indonesian fisheries export policy, the study highlights that logistical infrastructure particularly cold storage at airports and digital system reliability is as critical as trade agreements for improving export competitiveness.

**Limitations and Future Research:** This study is limited to a single freight forwarder and relies primarily on interview data for constraint frequency assessment. Future research should employ quantitative operational data (shipment records, delay logs) to validate constraint frequency rankings and conduct comparative case studies across multiple freight forwarders to assess generalizability. Additionally, research incorporating the exporter and airline perspectives would provide a fuller picture of the perishable fish air export logistics system.

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