



# A COMPARATIVE STUDY ON THE SHIPMENT DOCUMENTATION OF SPECIFIC CARGOS

## Hazardous, Perishable, and Project Cargo

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## Abstract

The global shipping industry manages a variety of cargo types. Each type is governed by different regulations and needs specific paperwork to ensure compliance, safety, and efficiency. This research paper offers a comparative study of shipment documentation requirements for three specialized cargo categories: hazardous cargo, perishable cargo, and project cargo. The study uses a mixed-methods approach, combining systematic document analysis of regulatory publications, which includes the International Maritime Dangerous Goods (IMDG) Code, IATA Dangerous Goods Regulations (DGR), ATP Agreement, and IATA CEIV standards, along with a structured review of academic literature and freight industry practices.

The findings show that while all three cargo types share a base of standard shipping documents, each requires a specific set of additional documentation based on its unique risks: safety risks for hazardous cargo, spoilage risks for perishable cargo, and logistical challenges for project cargo. The study points out gaps in documentation, compliance issues, and the increasing importance of digital documentation in today's shipping. It offers recommendations for freight forwarders, shippers, and regulatory bodies to improve documentation practices and decrease cargo rejections and compliance failures.

Keywords: Shipment documentation, hazardous cargo, perishable cargo, project cargo, IMDG Code, IATA DGR, freight forwarding, logistics compliance, cold chain, comparative study.

# 1. Introduction

## 1.1 Background and Context

International trade relies heavily on the timely and correct completion of shipping documentation. As global supply chains become more complex, the movement of specialized cargo has risen significantly. The International Maritime Organization (IMO, 2023) reports that around 10 to 15 percent of all containerized sea freight includes goods classified as dangerous or needing special handling. The global cold chain logistics market, which is crucial for perishable goods, was valued at USD 340 billion in 2023. It is expected to grow at a compound annual growth rate of 7.5 percent through 2028 (Grand View Research, 2023). Project cargo, which includes oversized and heavy-lift industrial components, has also increased alongside global infrastructure investments, especially in the energy, mining, and construction sectors.

Despite this growth, documentation errors remain a major cause of cargo rejection, port delays, and customs issues. The World Customs Organisation (WCO, 2022) estimates that documentation errors account for over 20 per cent of avoidable supply chain disruptions worldwide. This highlights the need to fully understand the specific documentation requirements for each type of cargo, both individually and in comparison. This knowledge helps freight professionals and organisations make better decisions in multi- cargo operations.

## 1.2 Problem Statement

Although there is a lot of information about individual cargo documentation requirements, there are few comparative studies that look at how documentation systems vary for hazardous, perishable, and project cargo types. Freight forwarding professionals and logistics managers who deal with different cargo categories often do not have a clear reference guide. Such a guide would outline the regulatory differences, documentation overlaps, and compliance duties that set these three cargo types apart. This lack of clarity raises the chances of documentation errors, cargo delays, financial penalties, and harm to the reputation of shipping stakeholders.

## 1.3 Research Objectives

The following goals are the focus of this study:

- To list and explain the essential shipment paperwork needed for project, perishable, and hazardous cargo.
- To evaluate these three cargo types' documentation frameworks in terms of regulatory foundation, document complexity, time-sensitivity, and compliance risk.
- To find similarities, variations, and gaps in the three cargo categories' documentation practices.
- To offer doable suggestions for enhancing specialized cargo operations' documentation compliance.

## 1.4 Research Questions

The following research questions serve as the basis for this investigation:

- Under the current international regulatory frameworks, what documentation is required for project, perishable, and hazardous cargo?

- In terms of complexity, governing authority, and compliance implications, how are the documentation requirements for these three types of cargo different?
- What are the main documentation issues that freight stakeholders dealing with these types of cargo encounter, and how might they be resolved?

## 1.5 Significance of the Study

This study adds to the body of knowledge on supply chain management and logistics by offering a systematic, side-by-side examination of the documentation needs for three high-value, high-risk cargo categories. Freight forwarders, customs officers, shippers, logistics students, and regulatory professionals who need a clear comparative understanding of the documentation ecosystem governing specialized cargo will find it directly applicable. The study also emphasizes how traditional paper-based procedures are being transformed by digital documentation and e-compliance platforms.

## 1.6 Scope and Limitations

The main modes of transportation for the three cargo categories in this study are international maritime and air freight documentation. Where applicable, road and rail documentation is cited. The ATP Agreement, IATA CEIV Pharma and Fresh standards, IATA Dangerous Goods Regulations (64th Edition), and the IMDG Code (Edition 2022–2024) are among the regulatory frameworks analyzed. The study recognizes that different countries of origin, destinations, and bilateral trade agreements have different documentation requirements and does not offer legal advice. Customs laws at the national level are only briefly discussed.

## 2. Literature Review

### 2.1 Overview of Shipping Documentation

Shipping documentation keeps international trade running smoothly, both legally and practically. Coyle and his team (2016) point out that these documents aren't just paperwork; they're contracts between shippers and carriers, they give customs the details needed for clearance, and they lay out the grounds for insurance and liability. The basics, like the Bill of Lading, Commercial Invoice, Packing List, Certificate of Origin, and Insurance Certificate, show up in almost every shipment. Still, if you're dealing with specialized cargo, you need even more paperwork to address the extra risks and handling concerns (Stopford, 2009; Branch, 2012).

Branch (2012) breaks shipping documents into four groups: contractual documents (like the Bill of Lading or Sea Waybill), financial documents (like the Letter of Credit or Commercial Invoice), regulatory documents (such as Dangerous Goods Declaration or Phytosanitary Certificate), and operational documents (like Packing List or Cargo Manifest). This way of organising things helps when comparing different types of cargo, especially since specialized shipments bring a pile of extra regulatory and operational documents.

### 2.2 Hazardous Cargo: Regulatory Framework

One of the more difficult area of the law of logistics is the transport of hazardous goods (hazardous materials). For sea carriage, this is the IMDG Code, an international body of standards updated every two years by the International Maritime Organization so nobody really gets too complacent about it. It lays out nine classes of dangerous goods, from explosives to radioactive matter to corrosives, and provides class- specific requirements and documentation for it (IMO, 2022). Systems also exist for air (IATA DGR), road (ADR) and rail (RID) carriage.

Moeller (2019) suggests that the key document underpinning hazardous cargo logistics is the Dangerous Goods Declaration or DGD, proof that the shipper has selected, packed, labelled and declared items in compliance with regulations. And easy to get it wrong, certainly Koi-Akrofi et al (2020) found frequent

errors on DGD, including incorrect UN numbers, lack of emergency contacts, incorrect quantity declaration, and they conclude such errors cause rejections at ports of loading.

Then we have the Material Safety Data Sheet (MSDS/SDS). Emerging from the UN's Globally Harmonised System (GHS), this sets out health and safety data for items. It is required for the carriage of chemicals.

This recent 2022-2024 edition of IMDG Code introduced updated packaging specifications, updated entries for substances subject to regulation and new provisions with regard to marine pollutants. The problem, as noted by UNCTAD (2023), is that developing country port authorities are not enforcing the IMDG regulations rigorously, and the failure to comply with IMDG regulations results in containers being mis declared, and these contribute to real safety risks.

### 2.3 Perishable Cargo: Cold Chain Documentation

Public health concerns and the need to ensure speedy and appropriate handling dominate perishable cargo documentation. Food safety guidelines set out by Codex Alimentarius ( jointly sponsored by FAO & WHO) influence national import document requirements for perishable food. The phytosanitary certificate, the product of the National Plant Protection Organisation (NPPO) of the exporting nation, is likely the most commonly required document for fresh produce, and is governed by the International Plant Protection Convention (IPPC, 2019).

One of the first researchers to explicitly study the link between documentation in the cold chain and product quality results was Abad et al (2009), who discovered that the lack of documentation on temperature recording was highly positively correlated to rejection rates of cargo and losses from spoilage. Later, Siddiqui et al (2014) applied the documentation link to the pharmaceutical cold chain and stressed the role of Good Distribution Practice (GDP) documentation in drug quality and regulation in transport. The International Air Transport Association's (IATA) CEIV (Centre of Excellence for Independent Validators) program ( which includes CEIVPharma and CEIVFresh) is seen as the premier certification standard for air cargo cold chain transportation, with document requirements including Cold Chain Compliance Records, temperature excursion reports and training of qualified personnel certificates (IATA, 2023). On the roads, an international agreement governs refrigerated road transport in Europe and parts of Asia, the ATP Agreement (Agreement on the International Carriage of Perishable Foodstuffs), which specifies required ATP certificates for refrigerated road vehicles used in international transport.

### 2.4 Project Cargo: Complexity and Custom Documentation

Project cargo, or heavy lift or out-of-gauge (OOG) cargo, has no single globally harmonized regulation such as the IMDG code. The absence of such a regulatory regime is also characteristic of project cargo logistics, whereby each consignment is a

unique engineering and logistics solution that necessitates custom documentation pieced together from numerous regulatory instruments (Rodrigue, 2020).

Wergeland (2014) defines project cargo as any consignment requiring special handling on account of weight, dimensions or the difficulty of supply chain integration. This category typically encompasses power-generating equipment, offshore structures, wind turbine components, and other industrial plants. In consequence, a project cargo consignment necessitates multi-faceted documentation that amalgamates the usual shipping documents with engineering certifications, route surveys, oversize/overweight permits, and, quite frequently, multi-modal documents covering sea, road and rail legs of a single voyage.

Notteboom and Rodrigue (2009) argue that, as there is no centralized regulation governing project cargo, there is an excessive burden on freight forwarders who must juggle multiple national regulations, port regulations, and carrier terms and conditions. A study by Christiansen et al. (2018) highlighted that documentation errors, particularly with regard to the issuing of permits and lashing certificates, were responsible for significant damage to project cargo during sea transport with corresponding financial implications for shippers and insurers.

## 2.5 Gaps in Existing Literature

According to a survey of the available literature, it is apparent that each of the aforementioned cargo types has been studied individually, but relatively few have been analysed comparatively between each of the cargo types. It is a common practice for logistics textbooks such as Branch (2012) and Coyle et al. (2016) to analyse specialised cargo documentation in different chapters of their textbooks without direct referencing between chapters. While articles are continually published in the logistics and supply chain academic journals with in-depth analyses of issues such as cold chain compliance (Siddiqui et al., 2014), errors in the declaration of DG's (Koi-Akrofi et al., 2020), and project cargo risk management (Christiansen et al., 2018), very few use a comparative structure to facilitate such an analysis. The purpose of this research paper is to facilitate such an analysis by comparing the aforementioned three types of cargo using a structured comparative matrix across documentation dimensions.

## 3. Research Methodology

### 3.1 Research Design

The research design utilized for this study is a descriptive-comparative research design using mixed methods. The research is descriptive when its goal is to provide a detailed description of a phenomenon, which is what is being undertaken here: to describe the documentation needs of the three cargo types. There is no attempt to test causal hypotheses. (Saunders et al., 2019). It is comparative through the systematic analysis of the different cargo types, against the same parameters on the analytical matrix, where one cargo type can be compared to another, side-by-side.

Mixed methods combine analysis through qualitative study of documents and through a more formalised analysis of secondary data. The formal side of document analysis in the form of an analytical matrix aids the qualitative analysis of regulations and also enables the conclusions drawn across the cargo types to be analyzed on the same parameters, as recommended by Yin (2018) for case comparative studies in applied management research.

### 3.2 Data Collection Methods

The sources of primary data for this investigation include:

- Comprehensive document analysis of relevant official regulatory documents such as: International Maritime Dangerous Goods (IMDG) Code, 2022-2024 Amendment; IATA Dangerous Goods Regulations (DGR), 64th Edition (2023); ATP Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be used for Such Carriage (UNECE, 2022); IATA CEIV Pharma and CEIV Fresh Programme Standards (2023); IMO Guidelines for the Carriage of Cargoes and Cargo Transport Units
- The source of secondary data for this study includes: peer-reviewed journal articles from International Journal of Logistics Management, Journal of Transport Geography and Supply Chain Management: An International Journal; World Customs Organisation (WCO), UNCTAD and IMO reports; freight forwarders association documentation templates, e.g. FIATA (International Federation of Freight Forwarders Associations)

### 3.3 Sampling Strategy

For this document analysis research, sampling means the selection of documents and regulatory frameworks rather than human beings. We have applied a purposive sampling strategy (Patton, 2015) where the criteria were (1) level of regulatory authority (issued by international bodies); (2) currency (latest edition until 2023 unless a landmark previous one existed); and (3) suitability (directly applicable to documentation requirements for the three kinds of cargoes considered in the analysis). Twenty-four primary legal documents and eighteen academic articles were chosen for the analysis.

### 3.4 Analytical Framework

The primary analytical tool is a seven-dimension comparative matrix for analyzing each cargo type across:

(1) primary risk profile; (2) responsible regulatory body; (3) obligatory documentation requirements; (4) the level of difficulty of required documentation; (5) the time-sensitivity of required documentation; (6) applicability to each mode of transport; and (7) effects of non-compliance. The basis for the comparison framework draws upon the document typology discussed by Branch (2012), and Saunders et al.'s (2019) discussion of how to conduct comparative case studies within management literature. A thematic analysis of the regulatory documents was also completed, identifying common documentation problem areas and current trends in the regulatory space, specifically digital documentation and e-compliance.

### 3.5 Validity and Limitations

Document analysis is dependent on the authoritative and comprehensive nature of the documents sourced. Triangulating findings from various independent sources of regulation and incorporating peer-reviewed sources attempts to address the validity issue for this study. However, three issues exist with this approach. Firstly, the documentary requirements vary between national jurisdictions, and only broadly comparable (international) ones were included in this analysis. This study cannot provide comprehensive coverage of all national-specific regulatory requirements. Secondly, this analysis does not involve the input of a primary source-interviewed freight industry personnel, and therefore lacks a strong practical

compliance perspective. This aspect of this study would benefit from incorporating interviews with freight forwarders and customs brokers in future studies.

## 4. Hazardous Cargo Documentation

### 4.1 Regulatory Framework

Dangerous cargo, which the IMDG Code defines as goods that can present significant danger to health, safety, property, or the environment, is covered by the broadest, most codified documentation regime among the three classes of cargo considered in this article. There is a multi-tiered system of legislation, with the UN Recommendations on the Transport of Dangerous Goods (often known as the Orange Book) providing the global standard from which modal legislation arises: the IMDG code (sea), the IATA DGR (air), the ADR (road) and the RID (rail). This legislation is binding, and its violation is a criminal offence in most countries.

Under the IMDG Code, goods can be divided into nine hazard classes according to their physical or chemical properties. There are distinct requirements imposed by each class regarding documentation, packing, marking and labelling. The 2022-2024 amendment made significant changes concerning the classification of lithium batteries (Class 9)-an issue which is becoming increasingly prevalent with the increase of EV components in world trade-and to the documentation requirements of marine pollutants.

### 4.2 Mandatory Document Set

The following documents are mandatory for all hazardous cargo shipments and must be prepared by the shipper before handover to the carrier:

Document	Purpose and Key Requirements
<b>Dangerous Goods Declaration (DGD)</b>	The primary legal document certifying proper classification, packaging, marking, and labelling. Must include: UN number, proper shipping name, hazard class, packing group, total quantity, and emergency contact details. Separate declarations are required per dangerous good.
<b>Material Safety Data Sheet (MSDS/SDS)</b>	Provides detailed hazard, handling, storage, and emergency information. Governed by the UN GHS (Globally Harmonised System). Mandatory for all chemical shipments; must be provided in the language of the destination country.
<b>Packing Certificate</b>	Certifies that cargo has been packed in accordance with applicable IMDG/IATA packing instructions. Must be signed by the packer and include the container/vehicle identification number.
<b>Shipper's Declaration (Air)</b>	An IATA-specific document is required for all air shipments of dangerous goods. Includes shipper and consignee details, DG
Document	Purpose and Key Requirements
	description, and certification of compliance. Available in DGD format for combined sea/air shipments.

<b>Emergency Document</b>	<b>Response</b>	Provides first responders with emergency procedures, fire-fighting measures, and first-aid instructions specific to the cargo's hazard class. Required under ADR for road transport; equivalent to TREM (Transport Emergency Card) in Europe.
<b>Competent Approval (CAA)</b>	<b>Authority</b>	Required for certain high-risk goods (e.g., explosives, radioactive materials, certain chemicals) that require specific governmental authorisation before shipment. Issued by the relevant national authority.
<b>IMDG Class Placards</b>	<b>Labels &amp;</b>	Not strictly a document, but labelling compliance is verified through the Dangerous Goods Declaration. Incorrect or absent labels are among the most common DG compliance violations.

### 4.3 Documentation Challenges

As expected, several common issues are present in DG documentation, of which misdeclaration – incorrect or fraudulent classification of DG - is arguably the most significant. CINS reports an average of over 250 DG misdeclaration incidents per annum between 2018-2020. It ranges from rejected consignments to catastrophic ship fire/explosion.

Other common problems associated with DG documentation include:

- A lack of trained shipper personnel who must fill in DGD forms
- Language issues for multimodal, multi-country shipments
- The classification of marginal/borderline DG items
- The lack of e-DGD adoption, which, although removing transcription error, demands massive system investment within the supply chain.

## 5. Perishable Cargo Documentation

### 5.1 Regulatory Framework

Perishable cargo can be any goods that will degrade over time while stored at normal conditions for quality and/or safety. Examples of perishable cargo include fresh produce, frozen goods, seafood, dairy products, fresh cut flowers, live animals, and temperature-sensitive pharmaceutical products. While a unified international convention doesn't exist for perishable cargo as with hazardous cargo, regulation is established by a blend of international agreements, bilateral phytosanitary measures, food safety standards and voluntary industry certifications.

The main international instruments are the International Plant Protection Convention (IPPC) for the requirement of phytosanitary certificates on plant related commodities, Codex Alimentarius standards for baseline food safety requirements for internationally traded food products, the ATP Agreement concerning the international transport of perishable foodstuffs and special conditions for this transport by road, and IATA CEIV Pharma and CEIV Fresh which are specific industry

certifications standards for pharmaceutical and food cold chain air freight. Many markets impose additional documentation requirements based on Sanitary and Phytosanitary (SPS) agreements signed between trading countries.

## 5.2 Mandatory Document Set

Document	Purpose and Key Requirements
<b>Phytosanitary Certificate</b>	Issued by the NPPO of the exporting country. Certifies that plant-based products are free from quarantine pests and meet the phytosanitary import requirements of the destination country. Required for virtually all fresh produce shipments.
<b>Health / Veterinary Certificate</b>	Required for animal products (meat, fish, dairy). Issued by an official veterinarian of the exporting country. Certifies that products are fit for human consumption and comply with the importing country's veterinary standards.
<b>Cold Chain Compliance Record / Temperature Log</b>	Documents the temperature history of the cargo throughout transit. IATA CEIV Pharma requires continuous temperature monitoring with data loggers; CEIV Fresh recommends the same. Critical evidence in cargo damage claims.
<b>ATP Certificate</b>	Required for refrigerated vehicles used in international road transport of perishable foodstuffs under the ATP Agreement. Certifies that the vehicle meets minimum thermal performance standards. Renewed every six years.
Document	Purpose and Key Requirements
<b>Certificate of Origin</b>	Establishes the country of production. May affect import duties and eligibility under preferential trade agreements (e.g., ASEAN Free Trade Area, EU trade agreements). Required by most importing countries.
<b>Fumigation Certificate</b>	Required when cargo has been treated with fumigants (e.g., methyl bromide) to comply with the importing country's quarantine requirements. Must specify fumigant used, concentration, duration, and date of treatment.
<b>CITES Permit</b>	Required for shipments involving species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Applies to certain seafood (e.g., shark fins, certain tuna species) and ornamental plants.

## 5.3 Documentation Challenges

A unique documentation challenge of the perishable cargo sector stems from the intersection of the time pressure to deliver and bureaucratic procedures. Documentation processes (e.g. Phytosanitary inspection, obtaining a certificate) can last for days or weeks, which causes a structural tension with the short shelf life of fresh fruits and vegetables. In a 2022 World Bank survey, 34 percent of fresh produce exporters from developing countries declared "delays in documentation processes" to be a main driver of spoilage losses for cargo.

A second issue involves the uniformity of cold chain documentation. A temperature excursion (any deviation of the temperature above or below the required range) would not be of regulatory or insurance significance without an adequate and continuous log of the recorded temperatures. Most small logistics service providers lack the necessary technology for the

digital certification of temperature readings, which could make them vulnerable to disputes regarding cargo damage. The increase in use of IoT-powered temperature logging, in combination with IATA CEIV certification, is contributing to closing this divide in premium freight, but the adoption has not been widespread everywhere.

## 6. Project Cargo Documentation

### 6.1 Regulatory Framework

Where does project cargo fit into all this specialised cargo? It lies on its own because it is not yet subject to a single, codified international regulatory regime like hazardous goods (IMDG Code / IATA DGR) and perishable goods (IPPC / Codex Alimentarius / ATP). The relevant documentation for project cargo is drawn from many separate places: from the carriers, from national transport authorities, from the port authority, and from insurers. This is only a consequence of the diverse nature of the shipment itself (e.g., transformers, industrial reactors, wind turbine parts, bridge girders, parts of an offshore platform or whole generating units).

The International Association of Heavy Lift and Project Forwarding Agents (IAPHF) and FIATA offer guidance as to project cargo documentation practices. They are not legally enforceable standards. National transport authorities control permissions for carrying loads over dimension and weight limits. Classification societies (Lloyd's Register, Bureau Veritas, DNV, etc.) provide technical validation of heavy lift operations and cargo lashing.

### 6.2 Mandatory Document Set

Document	Purpose and Key Requirements
<b>Bill of Lading (OOG / Heavy Lift)</b>	Modified B/L for out-of-gauge cargo. Includes precise dimensions (length, width, height) and weight. Specifies special handling instructions and is the primary contract of carriage document.
<b>Oversize / Overweight Permit</b>	Issued by national transport authorities for each road leg of the journey. Specifies permitted route, travel hours, maximum speed, and escort requirements. Multiple permits required for cross-border road transport.
<b>Route Survey Report</b>	Pre-shipment survey of all road, bridge, port, and installation routes. Documents clearances, weight limits, turning radii, and any infrastructure modifications required. Produced by specialist survey companies.
<b>Engineering Certificate / Lashing Certificate</b>	Issued by a classification society or certified marine surveyor. Certifies that the cargo securing and lashing arrangements meet the requirements of the CSS Code (IMO Code of Safe Practice for Cargo Stowage and Securing).
Document	Purpose and Key Requirements
<b>Pre-shipment Inspection Certificate</b>	Confirms that cargo dimensions, weight, and condition have been inspected and verified prior to loading. Often required by the buyer's bank for Letters of Credit on high-value equipment shipments.

<b>Insurance Certificate (All Risk)</b>	Standard marine cargo insurance supplemented by specific cover for heavy lift and engineering risks. Policy values for project cargo commonly exceed USD 10 million; documentation must precisely match the cargo specification.
<b>Customs Admission (ATA/TIR)</b>	<b>Temporary Documents</b> Required when project equipment (e.g., cranes, specialised tools) is temporarily imported for installation and then re-exported. ATA Carnet simplifies this process in member countries of the ATA Convention.
<b>Multi-modal Document</b>	<b>Transport</b> Covers multiple legs of a project cargo shipment under a single document when issued by a multi-modal transport operator (MTO). Reduces documentary complexity in multi-modal operations.

### 6.3 Documentation Challenges

Project cargo documentation can involve and create a few ongoing difficulties. Firstly, road transport permit acquisition for oversized and/or overweight loads is protracted and highly dependent on local government administration; in certain countries, six to twelve weeks for permits can be commonplace, necessitating detailed early project planning and effective liaison between freight forwarders and project managers. Secondly, the stated and actual dimensions and weight of the cargo are of importance to several different documentation processes and, in many instances, have led to failure of the load plan and thus, loss of cargo and/or vessel stability as a consequence of a deviation between engineering specifications and actual cargo dimensions at loading time (BIMCO, 2022).

Thirdly, while the requirement for Marine Cargo Insurance for standard cargo will always generate certain specific documentation requirements, project cargo insurance requirements, bespoke wordings with specialized marine insurers must often be negotiated with underwriters for this, as opposed to Hazardous Cargo's single standard documentation requirements for a Dangerous Goods Declaration. The lack of a standard documentation template and the dependency that this necessitates on the skill of individual freight forwarders.

## 7. Comparative Analysis and Findings

### 7.1 The Comparative Documentation Matrix

Table below presents the core comparative analysis of this study, evaluating the three cargo types against seven analytical dimensions. This matrix constitutes the primary analytical output of the research and synthesises the findings from Chapters 4, 5, and 6.

Dimension	Hazardous Cargo	Perishable Cargo	Project Cargo
<b>Primary Risk</b>	Safety to people, property & environment	Product spoilage & public health	Structural failure & logistical complexity
<b>Governing Body</b>	IMO (IMDG), IATA DGR, UN (GHS)	IPPC, Codex Alimentarius, IATA CEIV, ATP	No single body — national authorities, FIATA, class societies
<b>Core Documents</b>	DGD, MSDS/SDS, Packing Certificate, CAA, Emergency Response	Phytosanitary Cert, Health Cert, Cold Chain Records, ATP Cert	OOG B/L, OOG Permits, Route Survey, Lashing Certificate

<b>Doc Complexity</b>	Very high — uniform, highly standardised international format	Moderate to high — varies by commodity and country pair	Very high — bespoke per shipment; no standard templates
<b>Time-Sensitivity</b>	Moderate — documents prepared pre-shipment	Very high — shelf life and border speed critical	Low to moderate — long project planning cycles
<b>Compliance Consequence</b>	Criminal liability, cargo rejection, blacklisting	Cargo destruction, import ban, shipper delisting	Project delays, permit revocation, cargo damage costs
<b>Digital Readiness</b>	Partly — emerging; IATA pilot ongoing	e-DGD Growing — Phytosanitary in 40+ countries (2023)	e-Low — largely paper-based; no global e-standard

## 7.2 Key Finding 1: Documentation Complexity Correlates with Standardisation Inversely

Perhaps one of the most surprising results of this comparative analysis is that the level of documentation complexity does not have a positive correlation with the level of international standardisation. That, where safety risk is highest (e.g. Hazardous cargo), documentation standardisation is highest; for example, the DGD is practically the same across modes and in countries, and IMDG Code instructions on packing and labelling are very clear and specific to the classes of goods. This, then, makes at least the execution level documentation less burdensome, despite increasing requirements for knowledge of the regulations. Project cargo involves the most documentation complexity in terms of practice, yet the least international standardisation. A unique package of documentation is created for each shipment, drawn from country regulations, carrier contracts, engineering documents, etc., placing heavy responsibility on the freight forwarder's technical skill and increasing the opportunity for documentation errors.

## 7.3 Key Finding 2: Time-Sensitivity Creates Structural Risk in Perishable Cargo Documentation

A key characteristic finding of this analysis, however, is that the documentation of perishable cargo has an inherent structural weakness: the timing of the documentation process (mainly phytosanitary inspection and certificate issuance by government authorities) is structurally opposed to the perishability of the product. In circumstances where governmental inspection services are lacking sufficient resources or are hampered by excessive bureaucracy, documentation delays can result in goods expiring on the way to origin customs – a loss, typically, not recoverable via insurance. This problem of structural tension does not exist in hazardous or project cargo, where documentation requirements, while burdensome, are not competing with the biological clock of a commodity. The increase in the use of ePhyto certificates (electronic phytosanitary certificates) under the IPPC's GBPS (Generic ePhyto National System) program appears to be the most positive system response to this structural weakness; already implemented by over 40 nations (as of 2023).

## 7.4 Key Finding 3: Digital Documentation Adoption is Uneven and Cargo-Type Dependent

In all three types of cargo, it is the conclusion of this research that the shift to the digitisation of cargo documentation is occurring but has not yet reached full completion, and is developing at very different rates for each type of cargo. The pharma

cold chain is at the forefront, the driving factors being regulation, such as the EU Falsified Medicines Directive and the US Drug Supply Chain Security Act (DSCSA) and IATA CEIV Pharma standards which are starting to dictate that digital temperature data is provided, but IATA eDGD for dangerous goods has a high level of uptake amongst key carriers though complete end-to-end digital workflows remain a rarity, and project cargo, being of a highly unique, high-value and low-volume nature is far behind with paper-based documents being used for most transactions.

## 7.5 Key Finding 4: Common Documentation Architecture with Divergent Overlays

All three goods have, at their base, the same core shipping documents. Namely, the Bill of Lading, the Commercial Invoice, Packing List, Certificate of Origin and the Insurance Certificate. In essence, each good has its special overlay of regulation and risk management on this basis. There are practical implications of this; freight professionals who are dealing with a mixed manifest can use their knowledge of the common base document and develop further into specialized knowledge in the overlay for the cargo type they are dealing with. It is also an implication of how there can be one single document management system, separating the common base and the cargo-specific overlay. It seems a fruitful area to look for potential software and logistics technology investment.

## 8. Conclusion and Recommendations

### 8.1 Summary of Key Findings

This investigation set out to explore, in a methodical framework, the specific shipping documentation requirements for hazardous, perishable, and project cargoes. The investigation establishes that there is a shared, underlying baseline of ordinary shipping documents for all three types of cargo, but also a very real and large overlay of specific documentation for each, driven by the risks, regulatory framework, and context of that individual cargo type. It can be established that hazardous cargo documentation is the most standardised, but documentation-heavy and compliance-oriented; perishable cargo documentation is the most time-sensitive and disparate; while project cargo documentation is highly individual and knowledge-intensive.

The comparative matrix (Table 7.1) is provided as a practical working document for freight professionals and students working in multi-cargo operations. The findings of this investigation - those about the inverse correlation between risk and standardisation, time risk structure in perishable documentation, disparity in levels of e-documentation uptake, and the baseline/overlay approach to the specific nature of cargo documents - provide a useful starting point for professionals and researchers alike.

### 8.2 Recommendations

#### For Freight Forwarders and Shippers

Invest in proper DG training and certification for all employees involved with hazardous cargo documentation (IATA DGR Category 6/7). A competent team helps mitigate over-declaration risk and carrier liability risk.

Deploy IoT-based temperature monitoring to all perishable movements and ensure that cold chain compliance is archived

electronically and available for recipient and carrier review, as well as insurer claims.

For project cargo, assign a single documentation coordinator tasked only with permit obtainment, survey commission, and lashing certificate maintenance of multi-leg complicated movements.

Investigate integrated documentation management platforms that may be split into core and specialised modules, thus reducing redundancy and controlling version proliferation across multi-modal movements.

### **For Regulatory Bodies and Governments**

Fast-track ePhyto adoption under the IPPC GBPS programme, targeting countries where the lack of ePhyto is already a known cause for losses in perishable cargo.

Establish project cargo documentation guidance, in the spirit of the IMDG Code, with standard templates for route survey reports, lashing certificate and multimodal transportation documents to overcome specialist knowledge barriers for small freight forwarders.

Improve IMDG documentation enforcement at the port level in developing countries through technical assistance programmes by the IMO.

### **For Future Research**

Future research, suggested in this paper, should focus on the collection of primary interview data from freight forwarders, customs and cargo insurers to develop the compliance facet of the comparative study. A quantitative survey on the relationship between documentation error and cargo rejection rates for the three cargo types would support the qualitative arguments made within this study. The costs and benefits of adopting digital documentation for each cargo type should be researched so that the appropriate investment decisions can be made by the logistics technology providers and freight operators.

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