MARITIME LAW IN THE 21ST CENTURY: NAVIGATING REGULATION, GROWTH, AND EMERGING CHALLENGES IN INTERNATIONAL TRADE

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DECLARATION

I, **Bharath Sankar P S**, do hereby declare that this dissertation work titled "**Maritime Law in the 21st Century: Navigating Regulation, Growth, and Emerging Challenges in International Trade**" researched and submitted by me to **the National University of Advanced Legal Studies** in partial fulfilment of the requirement for the award of degree of Master of Laws in **International Trade Law** under the guidance and supervision of **Dr. Anil R. Nair**, **Associate Professor**, **the National University of Advanced Legal Studies** is an Original, Bonafide and Legitimate work. It has been pursued for an academic interest. This work or any type thereof has not been submitted by me or anyone else for the award of another degree of either this university or any other university.

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Bharath Sankar P S

PREFACE

The present dissertation is the culmination of a year-long academic and intellectual engagement with the evolving domain of maritime law, particularly in the context of international trade in the 21st century. As a student of International Trade Law, I have always been intrigued by the legal infrastructure that underpins global commerce, an area where maritime law occupies a uniquely central and enduring position.

This study, titled "Maritime Law in the 21st Century: Navigating Regulation, Growth, and Emerging Challenges in International Trade", seeks to explore the intersection of legal continuity and reform in an era defined by rapid technological, environmental, and geopolitical change. It attempts to investigate whether the current legal framework, rooted in centuries-old principles and modern conventions such as UNCLOS and IMO protocols, is sufficiently adaptive to address pressing challenges like automation, decarbonisation, maritime security threats, and evolving trade dynamics.

The idea for this dissertation was inspired by the realization that while maritime law has traditionally provided legal predictability and operational consistency to global shipping, it now faces unprecedented challenges that could either undermine or strengthen its foundational role in international trade. This work represents both a legal-historical exploration and a forward-looking assessment aimed at identifying regulatory gaps and proposing viable legal reforms.

This dissertation would not have been possible without the scholarly guidance and encouragement of Dr. Anil R. Nair, Associate Professor at the National University of Advanced Legal Studies, whose mentorship throughout the research and writing process was both patient and profound. I also extend my gratitude to the esteemed faculty at NUALS for shaping my academic approach and deepening my understanding of international legal systems.

While I have drawn upon a wide body of literature, and international instruments, the views expressed, and the conclusions reached are entirely my own. I present this dissertation with humility and academic sincerity.

Bharath Sankar P S

LIST OF ABBREVIATIONS

Abbreviation	Expansion
UNCLOS	United Nations Convention on the Law of the Sea
IMO	International Maritime Organization
SOLAS	International Convention for the Safety of Life at Sea
MARPOL	International Convention for the Prevention of Pollution from Ships
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
MLC	Maritime Labour Convention
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
FAL	Convention on Facilitation of International Maritime Traffic
LLMC	Convention on Limitation of Liability for Maritime Claims
SDR	Special Drawing Rights
GA	General Average
CMI	Comité Maritime International
ISM Code	International Safety Management Code
SAR	Search and Rescue Convention
ITLOS	International Tribunal for the Law of the Sea
TRIPS	Trade-Related Aspects of Intellectual Property Rights
AI	Artificial Intelligence
GHG	Greenhouse Gas
CLC	Civil Liability Convention

TABLE OF CASES

Sl.No.	CASE TITLE	CITATION
1.	United States v. Dire	680 F.3d 446 (4th Cir. 2012)
2.	Enrica Lexie Incident (Italy v. India)	PCA Case No. 2015-28, Award (May 21, 2020)
3.	Philippines v. China (South China Sea Arbitration)	PCA Case No. 2013-19, Award (July 12, 2016)
4.	Lauritzen v. Larsen	345 U.S. 571 (1953)

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Maritime law lies at the core of international trade, forming the legal backbone of a system where over 80% of global commerce depends on ocean transport. Far from being a mere technical domain, maritime regulation plays a pivotal role in facilitating the seamless movement of goods across borders, anchoring economic interdependence among nations. From ancient seafaring customs to the intricacies of modern shipping treaties, the maritime legal framework has continuously evolved in response to commercial necessity, political shifts, and technological change.

Key doctrines such as freedom of navigation, flag state jurisdiction, and port state control enshrined in instruments like the United Nations Convention on the Law of the Sea (UNCLOS) and complemented by International Maritime Organization (IMO) conventions have historically supported this system. These principles underpinned the expansion of trade in the globalization era, ensuring legal predictability and operational safety. However, the rise of automation, cyber threats, environmental crises, and renewed geopolitical tensions now tests the resilience of these long-standing norms.

This dissertation explores maritime law through the dual lenses of legal continuity and reform. It begins by tracing the development of maritime regulation from classical codes like the *Lex Rhodia* and the *Rolls of Oléron* to colonial admiralty institutions and modern treaty regimes. It then critically examines whether current legal instruments remain fit for purpose in light of pressing challenges: autonomous vessels, decarbonisation mandates, maritime security risks, and contested maritime boundaries.

The central question guiding this inquiry is whether the present international legal system can adapt swiftly enough to accommodate new realities, or whether more fundamental reforms are needed to prevent fragmentation and regulatory stagnation. Maritime law's global nature means that its effectiveness depends on international cooperation. Whether it continues to underpin a stable and sustainable trading system or becomes a source of legal uncertainty will depend on coordinated action by states, institutions, and industry leaders in the coming years.

This chapter sets the foundation for that inquiry by outlining the study's core research questions, objectives, scope, and methodology and also reviews key literature. The goal is to frame maritime law not just as a body of rules, but as a dynamic instrument capable of evolving in response to technological, environmental, and geopolitical shifts.

1.2 Statement of Problem

Despite its historically strong foundations, the existing maritime legal framework faces a range of contemporary pressures. The growing complexity of global shipping driven by automation, emerging security threats, and evolving climate regulations has exposed potential shortcomings in current treaties and enforcement mechanisms. This study examines whether targeted reforms are necessary to address these legal and regulatory gaps, or if the current system remains adequate to meet the shifting demands of modern maritime commerce.

1.3 Research Questions

1. Does the current framework of maritime law adequately address the evolving demands of international trade, or are reforms necessary to bridge existing gaps?
2. How has maritime law evolved from ancient times to the modern legal frameworks like UNCLOS and IMO conventions?
3. What are the key impacts of contemporary maritime law on the efficiency and regulation of international trade?
4. What are the major legal gaps in maritime law concerning modern challenges, such as piracy, environmental sustainability, and technological advancements?

1.4 Research Objectives

1. To explore the historical evolution of maritime law and its foundational principles.
2. To examine the impact of key maritime legal frameworks on international trade.
3. To identify and analyse legal gaps in maritime law, focusing on emerging trade practices, environmental challenges, and technological advancements.

4. To evaluate the effectiveness of current maritime legal frameworks in governing international trade operations.

1.5 Scope of Study

This dissertation is confined to marine commerce. It excludes air, land and inland-waterway trade and is geographically global but thematically centred on treaty-state interactions.

1.6 Literature Review

Maritime trade has long relied on a delicate balance between global commerce and the treaty-based order of the seas. UNCLOS remains the system's constitutional core, yet recent scholarship emphasizes that the Convention was always meant to evolve. Lewis shows that the LOSC now functions as a "living treaty," open to dynamic interpretation as new environmental and technological pressures arise.[1] Against this flexible legal background, historians such as Jacks and Pendakur demonstrate how continuous reductions in transport costs since the mid-nineteenth-century "maritime transport revolution" have repeatedly reshaped patterns of global trade and, in turn, the regulatory challenges confronting flag, port and coastal States.[2]

One persistent challenge is the accountability gap attached to the traditional flag-state paradigm. Ringbom's doctrinal analysis of autonomous surface ships reveals that existing IMO instruments allocate responsibility to a flag State that may in practice exercise very limited control over robotics-driven vessels operating thousands of miles away.[3] Front-line mariners echo those concerns: a recent survey of licensed deck officers finds widespread scepticism about applying the 1972 COLREGs to unmanned vessels without substantial regulatory overhaul.[4] Taken together, these studies

[1] Reece Lewis, *The "Constitution for the Oceans"? The Law of the Sea Convention as a Living Treaty*, 74 Int'l & Comp. L.Q. 1, 4 (2025).
[2] David S. Jacks & Krishna Pendakur, Global Trade and the Maritime Transport Revolution, 92 *Rev. Econ. & Stat.* 745 (2010).
[3] Henrik Ringbom, Regulating Autonomous Ships-Concepts, Challenges and Precedents, 50 *Ocean Dev. & Int'l L.* 141 (2019).
[4] Elspeth Hannaford, Pieter Maes & Edwin Van Hassel, Autonomous Ships and the Collision Avoidance Regulations: A Licensed Deck Officer Survey, 21 *WMU J. Mar. Aff.* 233 (2022).

underline the difficulty of fitting cutting-edge technologies into jurisdictional boxes designed for crewed shipping.

A second and fast-moving strand of literature confronts decarbonisation. Parry argue that a global carbon levy would supply the uniform price signal necessary to unlock zero-emission fuels while channelling revenues into R & D for green technologies.[5] Adamowicz, focusing on EU initiatives such as FuelEU Maritime and ETS-extension, concludes that Brussels is effectively acting as a "laboratory" for future IMO rules.[6] Complementing that top-down perspective, Alamoush show that ports can accelerate behavioural change by rewarding cleaner vessels through differentiated dues yet warn that the proliferation of un-coordinated incentive schemes risks creating new market distortions.[7] More recently, Dominioni and Martínez interrogate the equity dimensions of the 2023 IMO GHG Strategy, highlighting distributive tensions between developed and developing States that could derail consensus-based law-making.[8] Dominioni and Petit extend that reasoning to carbon-price design, arguing that unilateral border-adjustment mechanisms will need careful coordination with IMO instruments to avoid "double taxation" and protectionism.[9]

Security studies add a third layer. Agyekum's ethnographic work in Tema and Takoradi documents how global carriers negotiate piracy risks in the Gulf of Guinea with Ghanaian officials, exposing gaps between international soft-law guidance (BMP-5) and local enforcement capacity.[10] The analysis suggests that decarbonisation, automation and security cannot be tackled in isolation: high-cost compliance regimes may push marginal operators toward flags of convenience and poorly policed waters, amplifying both environmental and security externalities.

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[5] Ian W.H. Parry, Dirk Heine, Kelley Kizzier & Tristan Smith, A Carbon Levy for International Maritime Fuels, 16 *Rev. Envtl. Econ. & Pol'y* 25 (2022).
[6] Magdalena Adamowicz, Decarbonisation of Maritime Transport – EU Measures as an Inspiration for Global Solutions?, 145 *Marine Pol'y* 105085 (2022).
[7] Anas S. Alamoush, Aykut I. Ölçer & Fabio Ballini, Ports' Role in Shipping Decarbonisation: A Common Port Incentive Scheme for Shipping GHG Emissions Reduction, 3 *Cleaner Logistics & Supply Chain* 100021 (2022).
[8] Goran Dominioni & Beatriz Martínez, The 2023 IMO Greenhouse Gas Strategy: Considerations of Equity, *Int'l J. Marine & Coastal L.* (advance online publication 2025).
[9] Goran Dominioni & Christy Ann Petit, Carbon Pricing for International Shipping and Border Carbon Adjustment Mechanisms: A Case for Regulatory Cooperation, 16 *Eur. J. Risk Reg.* 1 (2024).
[10] Humphrey Asamoah Agyekum, Tackling Maritime Security in the Gulf of Guinea: Interactions Between Global Shipping and Ghanaian State Agents, 17 *Afr. Security* 115 (2024).

While existing studies explore environmental regulation, technological change, and maritime security individually, they often overlook how these areas intersect. Little attention has been paid to how evolving rules jointly affect compliance and enforcement across maritime jurisdictions. This dissertation addresses that gap by offering an integrated analysis of these overlapping challenges.

1.7 Research Statement

The maritime regime can remain viable for contemporary trade only if reinforced by measurable compliance incentives, enforceable decarbonisation targets, and integration of human rights and labour standards.

1.8 Research Methodology

The research follows a doctrinal-analytical approach, basing its examination on core legal sources namely UNCLOS, a range of IMO instruments, and influential maritime cases. Supplemented by historical-comparative analysis, it traces the evolution of legal doctrines from ancient to modern times.

1.9 Chapterisation

Chapter 1 - Introduction

This chapter introduces the study by outlining the research problem, objectives, questions, and statement of problem. It provides the rationale, scope, and methodology, and presents a review of the relevant literature.

Chapter 2 - Historical Evolution of Maritime Law

The chapter charts maritime law's journey from its ancient roots to today's treaty architecture. It reviews early milestones such as the Lex Rhodia, medieval sea ordinances, and colonial admiralty jurisprudence, then shows how modern multilateral instruments most prominently UNCLOS and India's Admiralty Act 2017 knit those traditions into a unified legal framework.

Chapter 3 - Maritime Law's Impact on International Trade

This chapter explores how maritime law supports global trade by ensuring legal certainty and operational safety. It analyses the economic significance of maritime conventions and studies to demonstrate how regulatory frameworks affect shipping efficiency.

Chapter 4 - Contemporary Challenges in Maritime Law

This chapter addresses current threats to the maritime legal regime, including climate change, piracy, cyberattacks, and autonomous vessels. It evaluates whether existing laws are adequate or require reform to meet modern challenges.

Chapter 5 - Bridging the Gaps: Legal Reform and the Future of Maritime Law

This chapter proposes targeted reforms to address gaps in the current legal framework. Recommendations include strengthening enforcement mechanisms, incorporating environmental and labour standards, and adapting to technological advances.

Chapter 6 - Conclusion and Recommendations

The final chapter summarises the key findings and provides recommendations. It reflects on the future of maritime law, suggests areas for further research, and highlights the importance of evolving legal structures to support resilient maritime trade.

CHAPTER 2: HISTORICAL EVOLUTION OF MARITIME LAW

2.1 Ancient Foundations of Maritime Law

Maritime law stands among the most ancient branches of legal tradition, with roots stretching back to the earliest maritime civilizations. Centuries before formal legal systems emerged, coastal civilizations like the Egyptians, Phoenicians, and Greeks created customary rules to govern maritime trade and settle conflicts at sea. These early informal arrangements laid the groundwork for the structured maritime laws that would follow.[11]

Ancient Rhodes, a key commercial centre in the Aegean, is often recognized for developing one of the earliest and most impactful sets of maritime regulations. Known as the Rhodian Sea Law (Lex Rhodia), this legal framework is believed to have been in use between the 9th and 3rd centuries BCE.[12] While the original texts have not survived, references in later Roman sources preserve the Rhodian principles, demonstrating a remarkably advanced understanding of maritime regulation. Among its key principles were the doctrines of general average and jettison, which ensured that if cargo was sacrificed during a storm to protect the vessel, all parties with a financial interest in the voyage would share the resulting loss equitably.[13] This concept of shared sacrifice and collective responsibility continues to be a cornerstone of maritime law today, finding expression in general average clauses in modern international shipping agreements.[14]

The influence of Rhodian maritime principles was so profound that they were eventually adopted by one of history's greatest legal systems: Roman law. By the 3rd century BCE, during the Punic Wars, Rome had established itself as a formidable naval power and began incorporating Rhodian maritime rules into its own legal structure.[15]

Roman maritime law expanded on Rhodian foundations. Shipowners (nautae or exercitores) were often held strictly liable for cargo safety, unless they could prove that

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[11] *Maritime Law in Ancient Egypt Insights, Elearn College (Feb. 5, 2024), https://elearncollege.com/business-and-management/maritime-law-in-ancient-egypt-insights/ (last visited May 14, 2025).*
[12] Walter Ashburner, *The Rhodian Sea-Law* (Oxford Univ. Press 1909).
[13] See *Digest of Justinian* 14.2 (Theodor Mommsen et al. eds., Alan Watson trans., Univ. of Pa. Press 1985).
[14] *Id.*
[15] Wolfgang Graf Vitzthum, *From the Rhodian Sea Law to UNCLOS III*, 17 Ocean Yearbook 56, 60 (2003).

the loss was due to unavoidable circumstances, such as natural disasters or piracy.[16] Roman law also introduced the concept of foenus nauticum - a maritime loan in which lenders charged interest based on the successful completion of a voyage, an early mechanism for risk-sharing and maritime finance.[17] Through these innovations, Rome effectively upgraded the Rhodian code, blending ancient maritime principles with its own legal philosophy. The continued citation of Rhodian law in Roman legal texts attests to the deep entrenchment and cross-cultural acceptance of these ancient maritime norms.

The development of early maritime law was also greatly influenced by other ancient seafaring societies. Between 1200 and 500 BCE, the Phoenicians, who were centred in modern-day Lebanon, were some of the most active marine traders in the Mediterranean. Although no formal Phoenician legal texts on maritime practices have survived, historical evidence suggests that their commercial practices including the formation of merchant guilds and maritime associations influenced the development of Greek and Roman shipping law.[18] Phoenician practices likely included foundational concepts such as contractual obligations, shared vessel ownership, and possibly even early forms of marine insurance, such as bottomry loans.[19]

Meanwhile, in South Asia, ancient India also witnessed the early institutionalization of maritime regulation. Maritime administration, including the appointment of a Superintendent of Ships and the imposition of tolls and port dues, is mentioned in texts such as Kautilya's Arthashastra (c. 300 BCE).[20] These measures suggest that the state actively supervised and regulated sea trade, recognizing its strategic and economic importance even in antiquity.[21]

By the end of the classical period, a broadly consistent body of maritime principles had taken shape throughout the Mediterranean world. These comprised the prescribed

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[16] *Roman Law and Maritime Commerce* (Peter Candy & Emilia Mataix Ferrándiz eds., Edinburgh Univ. Press 2022), https://www.jstor.org/stable/10.3366/j.ctv2mm2045 (last visited May 11, 2025)
[17] *Id.*
[18] Denise Demetriou, *Phoenician Trade Associations in Ancient Greece*, ANE Today, Am. Soc'y of Overseas Research (Aug. 2024)
[19] *The Intriguing History of Maritime Law*, Maintenance and Cure Blog (Sept. 21, 2020), https://maintenanceandcure.com/maritime-blog/the-intriguing-history-of-maritime-law/ (last visited May 24, 2025).
[20] Kautilya, *The Arthashastra*, Book II, Chapter 28, translated by R. Shamasastry (Government Press, Bangalore, 1915).
[21] *Indian Maritime History: A Glimpse into Ancient Naval Power and Trade Networks*, The Geostrata (Nov. 2024).

responsibilities of shipmasters, salvage, and general average concepts. These core concepts would persist for centuries, forming the legal backbone of maritime commerce. Remarkably, the principle of jettison introduced under Rhodian law over two millennia ago remains a foundational doctrine in modern international maritime conventions.

In essence, the ancient maritime world laid down not just scattered rules, but a coherent, quasi-universal framework. A ship sailing from Tyre to Carthage or Rome could generally expect that familiar legal norms would apply at each port. What sets the history of maritime law apart is its inherently international character from the outset shaped by cross-border trade, shared practical challenges, and the universal conditions faced by seafarers across different cultures and regions.

During the early medieval period, many of the principles inherited from Roman and Rhodian maritime traditions were preserved by the Eastern Roman, or Byzantine, Empire. Notably, the Rhodian Sea Law, or Nomos Rhodion Nautikos, compiled between the 7th and 8th centuries CE, reaffirmed classical doctrines such as general average and salvage.[22] This Byzantine codification reflected continuity with Greco-Roman legal traditions and remained influential through the 12th century.

As maritime trade expanded throughout Europe during the high Middle Ages, a new generation of regional sea laws began to emerge. These legal codes built upon the classical foundations but adapted them to the practical and commercial needs of local communities. Between the 11th and 14th centuries, three particularly influential collections of maritime laws came to prominence, often referred to as the three arches of modern admiralty law: (1) "the Consolato del Mare"[23] (Consulate of the Sea) from the Mediterranean, (2) the Laws of Oléron from Atlantic Europe[24], and (3) the Laws of Wisby"[25] from the Baltic and North Sea region. Each compilation translated prevailing

[22] Daphne Penna, *General Average in Byzantium*, in *General Average and Risk Management in Medieval and Early Modern Maritime Business* 53–72
[23] *Il Consolato del Mare*, in *The Book of the Consulate of the Sea*, translated by Ernest Nys, 1–2 (Ernest Nys ed., Ernest Nys trans., 1911).
[24] *The Rolls of Oléron*, in *The Black Book of the Admiralty*, vol. 1, 127–143 (Sir Travers Twiss ed., 1871).
[25] *The Laws of Wisby*, in *The Black Book of the Admiralty*, vol. 4, 1–45 (Sir Travers Twiss ed., 1876).

maritime customs into written codes, thus advancing the formalization and harmonization of admiralty law across major European ports.

2.2 Medieval Maritime Codes

Among the earliest and most comprehensive medieval maritime codes was the "Libre del Consolat de Mar", originating in Catalonia under the Crown of Aragon during the 13th century.[26] Though not formally published until 1494, the Consolat de Mar reflected practices already well-established across Mediterranean trade networks. Written in Catalan, the code served a dual function: it acted both as a procedural manual for merchant courts, known as "Consulates of the Sea," and as a substantive restatement of maritime law.[27]

The Consolato addressed an expansive range of topics: ownership and responsibilities of shipmasters, freight contracts, seafarers' wages and discipline, salvage and wreck procedures, general average, piracy, and even rules for naval warfare and privateering.[28] By consolidating these diverse elements into a coherent legal framework, the Crown of Aragon offered a model that was readily adopted in ports throughout the Mediterranean.[29] The influence of the Consolato del Mare extended well beyond Catalonia, finding acceptance in Spain, Provence, the Italian maritime republics, and other commercial centres around the region. Despite the issuance of local maritime ordinances in cities such as Trani, Amalfi, and Venice from as early as the 11th century, the Consolato remained a widely respected authority.[30] As a practical jus commune of the Mediterranean Sea, its provisions had a considerable impact on the evolution of contemporary maritime law. Through its widespread adoption, it helped ensure legal consistency: a Venetian ship arriving in Barcelona or a Catalan vessel docking in Genoa would be governed by comparable principles, fostering predictability and trust in regional trade.

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[26] *Il Consolato del Mare*, in *The Book of the Consulate of the Sea*, translated by Ernest Nys, 1–2 (Ernest Nys ed., Ernest Nys trans., 1911).
[27] *Historical Development of Maritime Law*, *Abyssinia Law* (July 20, 2013), https://www.abyssinialaw.com/study-on-line/maritime-law/historical-development-of-maritime-law (last visited May 11, 2025).
[28] *Id*.
[29] *Id.*
[30] *Id*.

As maritime activity grew along the Atlantic seaboard, the need for standardized sea laws became apparent in Western Europe. The Rolls or Laws of Oléron, a collection of rulings generally attributed to the late 12th century and connected to the island of Oléron, off the western coast of France, were the result of this. According to a popular, though debated, legend, Eleanor of Aquitaine introduced these laws around 1160 CE after encountering Mediterranean maritime codes during the Second Crusade.

Regardless of its origin story, the Laws of Oléron marked a major step in codifying seafaring regulations in the region. Written in Old French (Anglo-Norman), the code dealt with essential aspects of maritime conduct: the authority and obligations of the ship's master, the resolution of disputes between seafarers and merchants, salvage rights, and penalties for breaches of duty or misconduct aboard ship. These legal codes quickly spread beyond French shores. The Oléron rulings said to have been brought to England by King Richard I in the 1190s later became central to English admiralty tradition, especially after being incorporated into the *Black Book of the Admiralty*, a major 14th-century maritime compilation.[31]

The influence of Oléron extended across much of Europe. Its provisions were adopted in translation in Scotland, the Low Countries, parts of Germany, Flanders, and Castile. Federal courts occasionally used the Laws of Oléron as authoritative statements of general maritime law as early as the United States' legal history. This longevity underscores the enduring relevance of the code, illustrating how its principles were seen as universally applicable in maritime jurisprudence across jurisdictions and centuries.

In the Baltic and North Sea regions, expanding trade gave rise to the Laws of Wisby named after the town of Wisby (now Visby) on the Swedish island of Gotland, which served as a key port within the Hanseatic League. The Laws of Oléron and the Consolato del Mare had a significant influence on the Wisby Code, which was compiled in the 14th century and modified to meet the unique requirements of Baltic trade. It soon became the governing maritime code for the Hanseatic League, an influential

[31] *Laws of Oléron*, in 1 *The Black Book of the Admiralty* 127 (Sir Travers Twiss ed., 1871); Cambridge Core, https://www.cambridge.org/core/books/black-book-of-the-admiralty/laws-of-oleron/0C0738A86EB2ECE4A613CCAFB130D49D (last visited May 11, 2025).

alliance of North German and Baltic trading cities. The Wisby rules remained in force throughout the Baltic region well into the 16th century.[32]

Hanseatic towns also developed their own ordinances aligned with the Wisby provisions, covering issues such as salvage, jettison, shipping contracts, and average. By the close of the Middle Ages, the spread and similarity of these maritime codes meant that a relatively uniform body of law governed seafaring across Europe from Mediterranean through the North Sea. Despite being compiled in different languages and jurisdictions, the Consolato del Mare, Laws of Oléron, and Laws of Wisby consistently referenced each other and shared a common legal vocabulary rooted in practical maritime necessity.

During this period, the law of the sea evolved largely through custom shaped by the shared practices and mutual understandings of merchants and mariners worldwide, rather than by formal legislative enactment. This customary legal framework is often seen as having reached its peak during this era. Unlike many legal systems fragmented by feudalism or localized authority, medieval maritime law maintained a supranational character. Its legitimacy was not derived from kings or parliaments but from the mutual recognition and acceptance by seafarers who depended on predictability and fairness in an inherently risky environment.

2.3 Continuity of Maritime Principles into Modern Law

Many of the complex theories that maritime law had established by the end of the Middle Ages still serve as the foundation for admiralty law today. Principles such as salvage, which incentivizes volunteer attempts to save ships or cargo in danger, and general average, which divides losses resulting from sacrifices made for shared safety, continue to be fundamental. The medieval codes also acknowledged the duty of maintenance and cure, a legal obligation requiring shipowners to provide care and support to injured seamen which endures today as one of the most ancient and unbroken duties in admiralty law.[33]

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[32] Wisby, Laws of, LSData, https://www.lsd.law/define/wisby-laws-of (last visited May 12, 2025).
[33] *The Origins and History of Maintenance and Cure*, *Morrow & Sheppard LLP* (Dec. 28, 2018), https://www.morrowsheppard.com/blog/the-origins-and-history-of-maintenance-and-cure/ (last visited May 11, 2025).

The period also saw the emergence of marine insurance, which began appearing in Italian city-states during the 14th century.[34] Notably, the earliest known marine insurance policy dates to 1347 in Genoa, marking the beginning of a legal and commercial tool that is now indispensable in maritime operations.[35] In sum, the Middle Ages served as a critical bridge between antiquity and the modern age, transforming disparate local customs into semi-formal codes and laying the foundation for the regulatory frameworks that would be needed to support the global expansion of trade during the Renaissance and the Age of Discovery. Maintaining the internationalist spirit of maritime law while incorporating these long-held customs into the developing legal systems of new nation-states would be the next major difficulty.

2.4 Transition to National Control: The Colonial Era

As European powers expanded their empires overseas and competed for control over lucrative sea routes, maritime law was transformed from a largely customary, community-based system into a framework increasingly shaped by national sovereignty and geopolitical interests.[36] Two major developments defined this era:

i. a robust intellectual debate about the high seas' legal status and
ii. colonial powers like Britain, France, Spain, and the Netherlands, in particular, institutionalized national admiralty courts and laws.

While international waters were governed by principles of freedom and common use, each maritime nation developed its own internal body of admiralty law during the colonial period. The English Admiralty Court system, in particular, grew in prominence as Britain ascended to global maritime dominance. The High Court of Admiralty, formally established in 1360 under Edward III, was central to this legal regime.[37] It exercised jurisdiction over contracts, torts, crimes, and disputes arising on the sea,[38]

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[34] Maristella Botticini, Pietro Buri & Massimo Marinacci, *Presidential Address 2023: The Beauty of Uncertainty: The Rise of Insurance Contracts and Markets in Medieval Europe*, 21 J. Eur. Econ. Ass'n 2287, 2287–2326 (2023).
[35] Humbert O. Nelli, *The Earliest Insurance Contract: A New Discovery*, 39 J. Risk & Ins. 215 (1972).
[36] Thomas J. Schoenbaum, *Admiralty and Maritime Law* § 1-2 (5th ed. 2012).
[37] R.G. Marsden, *The High Court of Admiralty*, in 1 *Select Pleas in the Court of Admiralty* xiii (Selden Soc'y ed., 1894).
[38] William S. Holdsworth, *A History of English Law* 546 (3d ed. 1923).

often applying rules derived from both civil law and earlier codes like the Laws of Oléron.

Distinct from common law courts, admiralty courts did not use juries and operated with more flexible, Roman-influenced procedures. This made them particularly attractive to merchants seeking swift and consistent resolution of disputes. The Crown, too, favoured these courts due to the financial benefits derived from prize adjudications and other maritime claims. However, during the 17th century, common law judges challenged this jurisdiction through the use of writs of prohibition, effectively limiting admiralty to strictly maritime matters excluding, for example, marine insurance and commercial disputes conducted on land.

Parliament did not broaden the reach of admiralty courts until the 19th century, when statutes like the Admiralty Court Acts of 1840 and 1861 reinstated jurisdiction over matters such as cargo damage, vessel collisions, and ship mortgages.[39] [40]

Elsewhere in Europe, similar developments took place. A key example is France's Ordonnance de la Marine (1681)[41], introduced under King Louis XIV and his minister Colbert. This comprehensive code consolidated criminal, civil, and procedural maritime law, replacing older merchant consular courts with royal admiralty courts. Later, elements of this ordinance were integrated into Napoleon's Code de Commerce (1807)[42], which treated maritime law as a specialized branch of commercial law. Similar codification occurred in other civil law jurisdictions, including Spain, Italy, and the Netherlands, as part of a broader effort to domesticate admiralty law.

Although this codification process localized maritime law, it did not completely sever its international roots. Most national laws continued to reflect the core principles established in earlier sea codes and shared civil law traditions. Notably, Sweden's maritime code (1667)[43] and Denmark's (1683)[44] were early examples of such structured legal systems. In Britain's colonies and in the United States, which did not adopt comprehensive maritime codes, admiralty law evolved through judicial decisions and selected statutes. In the United States, federal admiralty authority was established

[39] Admiralty Court Act, 3 & 4 Vict., c. 65 (1840) (U.K.).
[40] Admiralty Court Act, 24 & 25 Vict., c. 10 (1861) (U.K.).
[41] *Ordonnance de la Marine* (1681) (Fr.).
[42] CODE DE COMMERCE [C. COM.] (1807) (Fr.).
[43] *Sjölag* [Swedish Maritime Code] 1667 (Swe.).
[44] *Danske Lov* [Danish Code] 1683 (Den.).

through Article III of the Constitution and the Judiciary Act of 1789, with its scope subsequently refined through court decisions over time.[45] In the foundational case of De Lovio v. Boit (1815), Justice Joseph Story advocated for a broad interpretation of admiralty jurisdiction, pushing beyond the narrow English model and ensuring American courts could handle a wider range of maritime matters.[46]

As European empires expanded, they exported their maritime laws to colonies across the globe. British Admiralty law, for example, was implemented in India, Australia, Africa, and the Americas. In British India, admiralty courts were first established in Bombay and Calcutta during the 18th century. These provisions were eventually formalized in the Colonial Courts of Admiralty Act of 1890, which expanded the jurisdiction of colonial high courts, allowing them to apply English maritime law while permitting certain adaptations to reflect regional contexts.[47]

Other colonial empires including France, Spain, and the Netherlands adopted comparable approaches, extending their own maritime codes to overseas territories. Yet, even as admiralty law became increasingly nationalized, many foundational principles continued to hold universal acceptance across legal systems. For example, pirates may still be tried by any country's courts because it was still considered a crime against all humanity (hostis humani generis).[48] Rules regarding prize captures, the seizure of enemy ships during wartime were similarly governed by customary international law and applied uniformly through specialized prize courts.

2.5 The Rise of International Cooperation

Efforts to harmonize maritime law on a global scale also took root in the late colonial period. The advent of technologies such as the telegraph and steam-powered vessels spurred rapid growth in international trade, exposing the limitations of disjointed national legal systems. In response, maritime legal experts founded the Comité

[45] U.S. CONST. art. III; Judiciary Act of 1789, ch. 20, § 9, 1 Stat. 73.
[46] *De Lovio v. Boit*, 7 F. Cas. 418 (C.C.D. Mass. 1815) (No. 3776).
[47] Ayush Verma, *The Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017*, iPleaders Blog (June 12, 2020), https://blog.ipleaders.in/admirality-jurisdiction-settlement-maritime-claims-2017/ (last visited May 12, 2025).
[48] *Id.*

Maritime International (CMI) in Antwerp in 1897 to promote legal uniformity.[49] Comprising legal experts from various countries, the CMI aimed to develop uniform rules for maritime issues such as ship collisions, salvage, and cargo liability. Partnering with the International Law Association, the CMI created prototype conventions that later served as foundational texts for a wide range of international maritime treaties established during the 20th century.[50]

By the close of the 19th century, the groundwork had been laid for a truly international maritime legal framework, integrating diverse legal traditions into a more cohesive global system. These developments built upon centuries of custom and legal innovation, while responding to the growing complexity and interconnectedness of global trade. The evolution from lex maritima to national admiralty courts and finally to international cooperation highlights the adaptive and resilient nature of maritime law through the colonial era and beyond.

A pivotal era in the evolution of marine law began in the 20th century. It signalled a conscious shift toward a single, global legal framework from various national and customary marine norms. As global trade expanded rapidly, so did the need for consistent, codified rules on issues such as vessel safety, liability, environmental protection, and dispute resolution. In reaction to these challenges, nations began cooperating through international treaties, primarily multilateral agreements and established bodies like the IMO to unify and regulate maritime governance on a global scale.

Brussels Convention

Expanding on the foundational work of the Comité Maritime International (CMI) in the late 1800s, a sequence of diplomatic gatherings in Brussels led to the creation of the first major international maritime treaties. Notably, 1910 saw the adoption of two key

[49] Francesco Berlingieri, *The Work of the Comité Maritime International: Past, Present, and Future*, 57 Tul. L. Rev. 1260 (1983).
[50] Nicholas J. Healy, *International Uniformity in Maritime Law: The Goal and the Obstacles*, 9 Cal. W. Int'l L.J. 553 (1979).

agreements: the Collision Convention and the Salvage Convention.[51] The Collision Convention established the principle of proportional fault, meaning that when multiple vessels were responsible for a collision, each would bear liability in proportion to its level of blame.[52] The Salvage Convention, enshrined the principle of "no cure, no pay" were salvors would only be rewarded if they succeeded in saving property.[53] Following their widespread adoption and entry into operation in 1913, these agreements gave shipowners, salvors, insurers, and states operating under various legal systems uniformity and legal certainty.[54]

Following World War I, attention turned to the regulation of maritime cargo transport. To establish uniform rules on carrier liability, the Hague Rules of 1924, formally titled the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading were adopted in Brussels.[55] The Rules placed restrictions on carriers' ability to exclude or reduce liability while requiring them to take reasonable steps to maintain seaworthiness and care for cargo. While the Hague Rules were generally viewed as shipowner-friendly especially due to liability exemptions such as those for navigational errors, they nonetheless marked the first internationally accepted framework for cargo liability. These rules later evolved through the 1968 Protocol into the Hague-Visby Rules, and were further supplemented by the Hamburg Rules in 1978, which aimed to shift the balance more in favour of cargo interests. Despite these developments, the original Hague or Hague-Visby wording remains widely used in many modern international bills of lading.

Other conventions followed. The 1926 Convention on Maritime Liens and Mortgages[56] and the 1924 Convention on Limitation of Shipowners' Liability[57] aimed to harmonize which claims had priority and how owners could limit their financial exposure. The 1952 Brussels Convention on the Arrest of Ships simplified the procedure for detaining

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[51] *Convention for the Unification of Certain Rules of Law with Respect to Collisions Between Vessels*, Sept. 23, 1910, 1910 U.K.T.S. No. 20.
[52] *Id.*
[53] *International Convention on Salvage*, Apr. 28, 1989, 1953 U.N.T.S. 193.
[54] *Id.*
[55] *International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading*, Aug. 25, 1924, 120 L.N.T.S. 155.
[56] *International Convention for the Unification of Certain Rules Relating to Maritime Liens and Mortgages*, Apr. 10, 1926, 120 L.N.T.S. 187.
[57] *International Convention for the Unification of Certain Rules Relating to the Limitation of the Liability of Owners of Seagoing Vessels*, Aug. 25, 1924, 120 L.N.T.S. 187.

vessels as security for maritime claims. Together with other mid-20th-century treaties, it helped minimize jurisdictional disparities and limited forum shopping, thereby enhancing the consistency and predictability of maritime litigation.[58]

2.6 Law of the Sea: From Geneva to UNCLOS

Alongside the evolution of private maritime law, the 20th century witnessed the emergence of a public international law of the sea. This movement gained momentum with the First United Nations Conference on the Law of the Sea (UNCLOS I) in 1958, marking the UN's leading role in shaping ocean governance.[59] The 1958 conference produced four Geneva Conventions, covering the continental shelf, the high seas, the territorial sea, and fisheries. These treaties codified several customary principles such as the 12-mile contiguous zone and the right of innocent passage but left key questions unresolved, particularly regarding the precise breadth of territorial waters.[60]

A second United Nations Conference on the Law of the Sea, held in 1960, ended without consensus, failing to resolve critical disputes most notably over the allowable breadth of territorial seas.[61] By the 1970s, growing concerns over resource conservation, environmental stewardship, and the governance of deep-sea mining prompted the international community to pursue a more unified legal regime. This effort culminated in the adoption of the United Nations Convention on the Law of the Sea (UNCLOS) in 1982, following nearly a decade of negotiations during the 3rd UN Conference on the Law of the Sea (UNCLOS III, 1973–1982).[62]

UNCLOS resolved the long-standing debate over territorial seas by allowing coastal states to assert sovereignty over waters extending till 12nm from the baseline.[63]

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[58] A. N. Yiannopoulos, *The Unification of Private Maritime Law by International Conventions*, 30 Law & Contemp. Probs. 370, 370–99 (1965).
[59] *First United Nations Conference on the Law of the Sea (UNCLOS I)*, Environment & Soc'y Portal, https://www.environmentandsociety.org/tools/keywords/first-united-nations-conference-law-sea (last visited May 24, 2025).
[60] *Convention on the Territorial Sea & Contiguous Zone* art. 24, Apr. 29, 1958, 516 U.N.T.S. 205 (up to 12 n.m.), summarized at https://legal.un.org/avl/ha/gclos/gclos.html (last visited May 11, 2025).
[61] NOAA, *Law of the Sea Convention-UNCLOS II 1960*, https://www.noaa.gov/law-of-sea-convention (last visited May 24, 2025).
[62] *United Nations Convention on the Law of the Sea*, opened for signature Dec. 10, 1982, 1833 U.N.T.S. 397 (entered into force Nov. 16, 1994).
[63] UNCLOS art. 3.

UNCLOS also introduced the concept of the Exclusive Economic Zone (EEZ), granting coastal states rights over the exploration and usage of natural resources within an area extending up to 200 nautical miles from their baseline.[64] The Convention further established legal frameworks for international straits and archipelagic states, clarified coastal states' rights to the continental shelf, and designated the deep seabed as the "common heritage of mankind," placing it under the oversight of the International Seabed Authority.[65] UNCLOS also set up mechanisms for scientific research, environmental protection, and dispute resolution through bodies such as the International Tribunal for the Law of the Sea. The Convention entered into force in 1994 and now has over 160 state parties. Notably, India signed the treaty in 1982 and ratified it in 1995.[66] Many of UNCLOS's core provisions are widely regarded as customary international law and are routinely observed even by non-party states like the US.

While UNCLOS provided a broad legal framework for the oceans, more detailed technical and regulatory standards tailored to the practical demands of global shipping also emerged during the 20th century. Much of this work was led by the International Maritime Organization (IMO), a specialized UN agency established in 1948 (originally as IMCO) and operational by 1959.[67] The IMO's mandate is to develop and maintain a comprehensive regulatory framework for international shipping, covering areas such as operational efficiency, maritime security, navigational safety, and environmental sustainability.

One of the IMO's earliest major responsibilities was the revision of the International Convention for the Safety of Life at Sea (SOLAS). Originally adopted in 1914 following the Titanic disaster, SOLAS was subsequently updated in 1960 and again in

[64] UNCLOS art. 57.
[65] International Seabed Authority, *About ISA*, https://www.isa.org.jm/about-isa/ (last visited May 05, 2025).
[66] *See United Nations Convention on the Law of the Sea (UNCLOS)*, United Nations Treaty Collection, https://treaties.un.org (last visited May 12, 2025).
[67] IMO, *Convention on the International Maritime Organization* (adopted 1948; IMCO operational 1959), https://www.imo.org/en/About/Conventions/Pages/Convention-on-the-International-Maritime-Organization.aspx (last visited May 11, 2025).

1974, eventually becoming the cornerstone of global maritime safety standards.[68] Since then, IMO has facilitated the adoption of numerous vital treaties, including:

- MARPOL 73/78 (International Convention for the Prevention of Pollution from Ships)[69] - tackling pollution from chemicals, oil, and trash in reaction to catastrophes such as the Torrey Canyon spill.
- COLREG 1972 (Collision Regulations)[70] - standardizing navigation rules, including lights and right-of-way.
- STCW 1978[71] - establishing global guidelines for crew certification and training.
- SAR Convention 1979[72] - putting in place procedures for maritime search and rescue coordination.
- SUA Convention 1988[73] - focusing on illegal activities at sea and maritime terrorism.
- ISM Code 1993[74] - requiring companies to implement safety management systems under SOLAS amendments.
- Maritime Labour Convention (MLC) 2006[75] - an ILO-led treaty improving seafarers' rights and conditions.

IMO conventions typically achieve near-universal adoption, as consistency in shipping standards is a practical necessity. Today, the IMO has 175 member states, representing

[68] *International Convention for the Safety of Life at Sea*, Nov. 1, 1974, 1184 U.N.T.S. 278 (entered into force May 25, 1980).
[69] *International Convention for the Prevention of Pollution from Ships*, Nov. 2, 1973, as modified by the Protocol of 1978, 1340 U.N.T.S. 184 (entered into force Oct. 2, 1983).
[70] *Convention on the International Regulations for Preventing Collisions at Sea*, Oct. 20, 1972, 1050 U.N.T.S. 16 (entered into force July 15, 1977).
[71] *International Convention on Standards of Training, Certification and Watchkeeping for Seafarers*, July 7, 1978, 1361 U.N.T.S. 190 (entered into force Apr. 28, 1984).
[72] *International Convention on Maritime Search and Rescue*, Apr. 27, 1979, 1405 U.N.T.S. 97 (entered into force June 22, 1985).
[73] *Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation*, Mar. 10, 1988, 1678 U.N.T.S. 221 (entered into force Mar. 1, 1992).
[74] *International Safety Management Code*, IMO Res. A.741(18), Nov. 4, 1993 (entered into force July 1, 1998).
[75] *Maritime Labour Convention*, Feb. 23, 2006, 2952 U.N.T.S. 5 (entered into force Aug. 20, 2013).

nearly the entire global fleet. As a result, modern ships operate under a tightly interlinked regime of treaties: construction and equipment must comply with SOLAS and Load Line rules; navigation with COLREG; crew competence with STCW; waste management with MARPOL; security with ISPS Code; and labour conditions with MLC.

Liability frameworks were also updated. The Civil Liability Convention (CLC) 1969[76], updated in 1992, established a compensation fund, and placed shipowners under severe accountability for oil pollution. The Athens Convention 1974[77] addressed liability for passenger injuries. The 1989 Salvage Convention[78] introduced rewards for preventing environmental damage, modernizing salvage principles.

By the dawn of the 21st century, maritime law had become a comprehensive, multilayered system, international in scope, diverse in content, and unified in objective. The ancient concepts of general average, assistance at sea, and freedom of navigation remain intact, but they now function within a sophisticated global legal structure born of collaboration and adaptation. The following chapters will explore how this evolved system impacts international trade today and how it continues to address the ever-changing realities of maritime commerce.

2.7 India's Maritime Legal Evolution: A Supporting Perspective

Though the global story of maritime law has largely been shaped by dominant Western powers and international treaties, India presents a compelling national narrative that parallels, and in some ways prefigures, global developments. India's maritime history is both ancient and dynamic, an example of how legal evolution has followed the rhythms of seafaring, trade, colonialism, and postcolonial reform.

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[76] *International Convention on Civil Liability for Oil Pollution Damage*, Nov. 29, 1969, 973 U.N.T.S. 3 (entered into force June 19, 1975).
[77] *Athens Convention Relating to the Carriage of Passengers and Their Luggage by Sea*, Dec. 13, 1974, 1463 U.N.T.S. 19 (entered into force Apr. 28, 1987).
[78] *International Convention on Salvage*, Apr. 28, 1989, 1953 U.N.T.S. 193 (entered into force July 14, 1996).

2.7.1 Ancient and Precolonial Maritime Traditions

India's maritime heritage stretches back thousands of years. Archaeological findings at Lothal, a port city of the Indus Valley Civilization dating to around 2400 BCE reveal one of the world's earliest known dockyards, pointing to active seaborne trade between ancient India and Mesopotamia.[79] References to sea voyages (samudra-yatra) appear in early Indian literature, including the Rigveda (c. 1500–1200 BCE), and more directly in Kautilya's Arthashastra (c. 300 BCE)[80], which described a Naval Superintendent and outlined procedures for customs collection, shipbuilding, and navigation. These texts indicate a proto-legal framework governing seafaring activities during the Mauryan era, likely informed by both customary norms and early state regulation.[81]

By the early Common Era, Indian port cities such as Muziris in Kerala maintained flourishing trade with Rome, and while formal legal instruments are scarce, maritime transactions were likely regulated through a combination of merchant guild customs, religious law, and mutual understandings with foreign traders. India's prominent role in early global maritime commerce is further evidenced by *The Periplus of the Erythraean Sea*, a first-century Greco-Roman travelogue that documents extensive trade links between Indian ports and markets across the Red Sea and Mediterranean regions.[82]

In the medieval period, dynasties like the Cholas (9th–13th centuries) expanded maritime influence through both trade and naval expeditions. Though formal codification is lacking from this period, Indian merchants are believed to have operated under guild-based rules, with Hindu and later Islamic legal influences shaping contracts, liability, and risk-sharing, early precursors to concepts such as bottomry and marine insurance.[83]

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[79] Dilip K. Chakrabarti, *Shipping and Maritime Trade of the Indus People*, Expedition Mag., Univ. of Pa. Museum (1984), https://www.penn.museum/sites/expedition/shipping-and-maritime-trade-of-the-indus-people/ (last visited May 11, 2025).
[80] Kautilya, *The Arthashastra*, Book II, Chapter 28, translated by R. Shamasastry (Government Press, Bangalore, 1915).
[81] Kautilya, *Arthaśāstra*, bk. II, ch. 28, *The Superintendent of Ships* (R. Shamasastry trans., Govt. Press 1915), https://www.wisdomlib.org/hinduism/book/kautilya-arthashastra/d/doc366074.html (last visited May 10, 2025).
[82] *Periplus Maris Erythraei: Text with Introduction, Translation, and Commentary* 51 (Lionel Casson ed. & trans., Princeton Univ. Press 1989).
[83] Kenneth R. Hall, *Reflections on the Chola Naval Expeditions to Southeast Asia*, in *Nagapattinam to Suvarnadwipa: Reflections on the Chola Naval Expeditions to Southeast Asia* 5–9 (Hermann Kulke, K. Kesavapany & Vijay Sakhuja eds., ISEAS 2009).

2.7.2 Colonial Influence and the Introduction of English Admiralty Law

The Portuguese were the first European trading power to establish a presence in India, followed by the Dutch, French, and eventually the British East India Company, which rose to dominance by the 18th century. This period marked the genesis of India's modern maritime legal framework. The British introduced formal admiralty courts to the subcontinent, beginning with the establishment of an Admiralty Court in Bombay in 1686 under a royal charter. This court had authority over matters such as piracy, prize claims, and commercial maritime disputes.[84]

Following the transfer of power to the British Crown, British maritime law became more broadly applied across India. The Colonial Courts of Admiralty Act of 1890 designated the High Courts of Bombay, Calcutta, and Madras as admiralty courts, granting them powers equivalent to those of the English High Court of Admiralty.[85] These courts applied English admiralty law, drawing on statutes such as the Admiralty Court Acts of 1840 and 1861 and various British Shipping Acts. Colonial legislation including the Indian Ports Act and the Indian Merchant Shipping Acts, modelled closely on their British counterparts enabled the enforcement of international maritime conventions that Britain had ratified.

By the early 20th century, India's admiralty regime was essentially a replica of the English system, applying common law doctrines and maritime statutes originally enacted in the UK.

2.7.3 Post-Independence Legal Development

After gaining independence in 1947, India kept a large portion of the colonial admiralty structure that it had acquired. Under their pre-independence charters, the High Courts of Bombay, Calcutta, and Madras retained their admiralty jurisdiction after independence. However, India swiftly began integrating into the international maritime

[84] Akshita Jain, *Charters of the British Crown and the Birth of Admiralty Courts in India*, iPleaders Blog (Nov. 1, 2022), https://blog.ipleaders.in/charters-of-the-british-crown/ (last visited May 11, 2025).
[85] Colonial Courts of Admiralty Act 1890, 53 & 54 Vict. c. 27, § 2 (U.K.).

legal order. It joined the IMO in 1959 and played a foundational role in the UNCLOS, signing the convention in 1982 and formally ratifying it in 1995.[86]

India's domestic legislation also began to evolve. The Merchant Shipping Act, 1958[87] was the landmark statute that consolidated provisions on ship registration, safety, crew welfare, and pollution control. It has since been amended to reflect key international conventions like SOLAS, MARPOL, and STCW. Notably, in anticipation of later internationally codified provisions. Even prior to the adoption of UNCLOS, India enacted the Territorial Waters, Continental Shelf, Exclusive Economic Zone and Other Maritime Zones Act in 1976. This legislation asserted India's sovereign rights over a 12-nautical-mile territorial sea, a 24-nautical-mile contiguous zone, and a 200-nautical-mile EEZ, aligning closely with the emerging global standards that UNCLOS would later formalize.[88]

On the private maritime law front, India faced a peculiar challenge: while its international obligations grew, its admiralty jurisdiction laws remained rooted in outdated British statutes. This created uncertainty regarding jurisdictional authority and the enforceability of certain maritime claims.

In the pivotal case of *M.V. Elisabeth v. Harwan Investment and Trading Co.* (1993)[89], the Supreme Court of India affirmed that the country's High Courts, as superior courts of record, possess inherent admiralty jurisdiction. It further ruled that, in the absence of specific domestic statutes, these courts are empowered to apply principles of international maritime law to ensure justice in maritime matters.[90] Court emphasized that India's maritime law must align with evolving global standards and reaffirmed the relevance of the historic lex maritima within Indian jurisprudence.[91]

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[86] Ashok G. K. V., *Explained: India and UNCLOS*, Usanas Foundation (2021), https://usanasfoundation.com/explained-india-and-the-united-nations-convention-on-the-law-of-the-sea-unclos (last visited May 24, 2025).
[87] *Merchant Shipping Act*, No. 44 of 1958, Acts of Parliament, 1958 (India).
[88] *Territorial Waters, Continental Shelf, Exclusive Economic Zone and Other Maritime Zones Act*, No. 80 of 1976, Acts of Parliament, 1976 (India).
[89] *M.V. Elisabeth & Ors. v. Harwan Investment & Trading Pvt. Ltd.*, 1993 Supp. (2) S.C.C. 433 (India).
[90] *Id.*
[91] *Id.*

2.7.4 Legislative Modernization: The Admiralty Act of 2017

To address the need for a clear statutory framework, Parliament enacted the Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017, which came into force on April 1, 2018. This legislation modernized India's admiralty law by repealing the previous Acts, thereby bringing the legal system in line with contemporary maritime practices. The Admiralty (Jurisdiction and Settlement of Maritime Claims) Act, 2017, codifies and extends admiralty jurisdiction to multiple High Courts across India.[92] This expansion moves beyond the traditional limits of the former Presidency towns Bombay, Calcutta, and Madras to now include coastal states such as Gujarat, Odisha, and Andhra Pradesh, thereby broadening judicial access to maritime justice. It clearly enumerates maritime claims, drawing from the Arrest Conventions of 1952 and 1999, including disputes related to salvage, seafarers' wages, collision, marine pollution, ship mortgages, and charterparties.[93] It also provides for vessel arrest, sets out the priority of maritime liens, and harmonizes domestic law with India's obligations under global conventions. In effect, the Act brings India's admiralty law in line with international best practices.

Alongside domestic legal reforms, India has demonstrated its commitment to international maritime standards by acceding to the Hong Kong Convention[94] on ship recycling and ratifying a broad range of key IMO conventions. These include SOLAS, MARPOL 73/78, the London Dumping Convention, the STCW Convention, the SAR Convention, and the SUA Convention, reflecting India's active role in promoting safe, secure, and environmentally responsible shipping practices.[95] India's active role as an IMO Council Member further reflects its commitment to maritime law reform and global cooperation.

India's maritime legal journey exemplifies a broader truth: while terminology, institutions, and codes evolve from ancient shastras to colonial charters to modern

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[92] *Admiralty (Jurisdiction and Settlement of Maritime Claims) Act*, No. 22 of 2017, Acts of Parliament, 2017 (India).
[93] *Id.*
[94] International Maritime Organization, *Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships*, opened for signature May 15, 2009, IMO Doc. SR/CONF/45.
[95] Directorate General of Shipping, *International Conventions Ratified by India* (2024), https://www.dgshipping.gov.in/Content/ShipManualChap10.aspx (last visited May 11, 2025).

statutes, the essence of maritime regulation in India has remained continuous. It has been shaped by trade, refined by colonial administration, and matured through post-independence engagement with international law. Even today, Indian courts often cite English precedents or refer to international norms on maritime liens and arrests, affirming the deep-rooted and evolving character of maritime law in Indian jurisprudence.

2.8 Conclusion

The evolution of maritime law both on the global stage and within India illustrates a distinctive interplay between enduring legal traditions and adaptive transformation, shaped by changing geopolitical, technological, and commercial dynamics over time. From the Rhodian sea laws to Roman formulations, through the medieval sea codes of Oléron, Wisby, and the Consolat de Mar, and later shaped by colonial expansions and national codifications, maritime law has always been adaptive. Yet its core principles, such as general average, carrier responsibility, and freedom of navigation, have endured. In the 20th century, this body of law achieved an unprecedented level of international coherence, thanks to institutions like UNCLOS and IMO.

India's example illustrates how even nations shaped by colonial legal systems have integrated themselves into this international framework. While the forthcoming chapters will explore contemporary issues such as global trade, port state control, and environmental challenges, the enduring thread of maritime law's evolution from ancient docks to modern shipping protocols remains foundational.

CHAPTER 3: MARITIME LAW'S IMPACT ON INTERNATIONAL TRADE

3.1 Maritime Law as the Foundation of International Trade

The entire framework of international trade is supported by maritime law. The many ships involved in transnational trade cannot be governed by the laws of a single country since the waters serve as a global commons. For legal coherence and predictability to be maintained, a consistent international legal framework is necessary.[96] This is the exact function of UNCLOS, which is commonly referred to as the oceans' constitution. It provides a logical legal basis for marine activities globally by combining established ideas like the freedom of the high seas and the right of navigation.[97]

Under UNCLOS, ships from all countries have the freedom to move freely through international waterways, international navigation straits, and exclusive economic zones (EEZs). This guarantees that, with very few exceptions, commercial shipping will continue to be able to pass through important maritime routes including the Suez Canal, the Strait of Malacca, and other important straits. By preserving the free flow of goods across international waters, these legal protections are essential to maintaining unbroken global trade.

The evolution of this legal regime began in the early 17th century, when Dutch jurist Hugo Grotius advocated the principle of mare liberum[98], freedom of seas as a counter to restrictive maritime claims made by rival powers. The idea of mare clausum, which permitted nations to claim control over vast marine domains, contrasted with his vision. UNCLOS, the codification of contemporary maritime law, is a synthesis of these conflicting philosophies.[99] While maintaining the wide rights of international navigation for all countries, it recognizes the sovereign rights of coastal states over

[96] Joseph C. Cox, *Statement of Joseph C. Cox: Hearing on the Law of the Sea Convention (October 4, 2007)*, UNCLOSdebate.org, https://www.unclosdebate.org/citation/1300/statement-joseph-c-cox-hearing-law-sea-convention-october-4-2007 (last visited May 24, 2025).
[97] *United Nations Convention on the Law of the Sea*, Dec. 10, 1982, 1833 U.N.T.S. 397, arts. 87–90.
[98] Hugo Grotius, *Mare Liberum* (1609)
[99] John Selden, *Mare Clausum* (1635), discussed in Charles Prior, Politics, Religion and Legal Argumentation in Selden's "Mare Clausum", 42 *Hist. J. Legal Ideas* 1 (2021), https://www.tandfonline.com/doi/full/10.1080/01916599.2021.1871930 (last visited May 13, 2025).

certain maritime areas, including the contiguous zone, the territorial sea (up to 12 nautical miles), and the EEZ.[100] [101]

Specifically, foreign vessels have the right to "innocent passage" into a coastal state's territorial sea as long as they do not endanger the peace, security, or integrity of the environment. Additionally, even for armed boats, UNCLOS ensures transit passage across international straits and "archipelagic sea lanes passage" through archipelagic waters, guaranteeing that strategic and commercial traffic cannot be arbitrarily obstructed.[102] These principles ensure that coastal states cannot unilaterally obstruct the essential arteries of global commerce. Indeed, legal uniformity in maritime regulation is indispensable. As one legal commentator notes, if each nation were to enforce radically divergent maritime rules, the result would be chaos for the maritime community, with serious consequences for international trade.[103]

Clarifying jurisdictional authority is one of marine law's other main purposes. Ships are often subject to the laws of their flag state, or the state under which they are registered, when they are in the high seas, which are regions outside of any one state's sovereign jurisdiction. This idea, which has been strengthened by decades of jurisprudence, is formalized in Article 92 of UNCLOS.[104] The law of the flag doctrine was established by the U.S. Supreme Court in the seminal decision of Lauritzen v. Larsen, which held that the flag grants the state both duty and jurisdiction over the vessel. The Court holds that a state assumes legal responsibility when it permits a ship to fly its flag, and only that state has the authority to inquire into the compliance or legitimacy of the vessel's registration.[105]

This framework offers vital legal certainty for global traders and shipowners. As long as a vessel adheres to its flag state's regulations and the applicable international conventions, it can traverse international waters without fear of interference from other nations. This lessens the risk of legal issues or arbitrary detentions, fostering a more efficient and secure global trading environment.

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[100] UNCLOS art. 3
[101] UNCLOS art. 57
[102] UNCLOS arts. 17-19
[103] Joseph C. Cox, *Statement of Joseph C. Cox: Hearing on the Law of the Sea Convention (October 4, 2007)*, UNCLOSdebate.org, https://www.unclosdebate.org/citation/1300/statement-joseph-c-cox-hearing-law-sea-convention-october-4-2007 (last visited May 14, 2025).
[104] UNCLOS art. 92.
[105] UNCLOS art. 92 (law of the flag); Lauritzen v. Larsen, 345 U.S. 571, 584 (1953)

In summary, maritime law facilitates international commerce by enshrining the freedom of navigation, enforcing uniform regulatory standards, and clearly delineating jurisdictional authority over vessels in transit. This legal infrastructure allows a container ship to sail seamlessly from one continent to another, passing through multiple jurisdictions with consistency and legal predictability. The International Chamber of Shipping highlights that a consistent set of regulations to adhere to across borders is very beneficial to the global shipping business and the customers it serves.

3.2 Flag States and the Legal Order of Shipping

Every commercial vessel must be registered in accordance with the laws of the flag state, which is the nation that has primary control over it. The foundation of maritime regulation is represented by flag states, which grant nationality to ships by allowing them to fly their flag and then have the duty of making sure that these ships abide by relevant international laws and treaties. Flag states must effectively exercise jurisdiction and control over administrative, technical, and social aspects pertaining to ships flying their flag in accordance with UNCLOS Article 94.[106] This duty includes making sure that ships are built and equipped correctly, that sailors are appropriately taught and qualified, and that international standards for environmental protection, collision avoidance, and marine life safety are followed.[107] In short, flag states function as the principal regulators of vessels, even when those ships are operating thousands of miles away in international waters.

The IMO has issued a number of conventions that strengthen the responsibilities of flag nations. Notably, flag administrations are required by the International Convention for the Safety of Life at Sea (SOLAS) to inspect and certify ships in order to verify that they adhere to strict safety regulations, such as those pertaining to navigation equipment, lifeboats, fire protection systems, and hull integrity. Likewise, flag nations are required by the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) to guarantee that seafarers get training in accordance with consistent international standards. Meeting these responsibilities is

[106] UNCLOS art. 94.
[107] OP-ED: UNCLOS, Flag States, IMO and Accountability, Human Rights at Sea, https://www.humanrightsatsea.org/news/article/oped-unclos-flag-states-imo-and-accountability (last visited May 15, 2025).

essential to the smooth operation of global trade and goes beyond simple legal requirements. When a ship departing from one port can be trusted to meet standardized safety and crewing norms upon arrival at another, the risks of accidents, delays, and disruptions to supply chains are significantly reduced. Indeed, over the past few decades, the global safety record of commercial shipping has improved markedly, with the average number of major shipping losses per year declining, an achievement attributable in large part to enhanced flag state oversight and compliance with international standards.[108]

However, the phenomena of flags of convenience have occasionally undermined the efficacy of flag state legislation. This term refers to open registries run by states with comparatively loose inspection and regulatory standards, allowing shipowners, frequently located abroad, to register boats with little scrutiny or taxation. These flags, which include those of Panama, Liberia, and the Marshall Islands, currently account for a sizable amount of the global merchant fleet by tonnage. Even though a large number of open registries uphold an acceptable level of adherence to international norms, there are still worries that some put profit ahead of legal enforcement, leading to fleets that might contain inferior ships. Although a true connection between a ship and its flag state is required by UNCLOS Article 91 in theory, this criterion is not always upheld in reality.[109]

Previous maritime catastrophes have provided a clear illustration of the implications of insufficient flag state oversight. For example, a 26-year-old single-hull tanker carrying the Bahamas' flag was engaged in the 2002 *Prestige* oil spill[110]. The efficacy of the flag state's monitoring was called into doubt after the ship broke apart and sank off the coast of Spain, releasing over 63,000 tons of oil into the Atlantic. Subsequent investigations found significant structural flaws and maintenance problems.[111] Significant regulatory changes, including as the quicker phase-out of single-hull oil tankers under the International Convention for the Prevention of Pollution from Ships (MARPOL), were

[108] Allianz Commercial, *Safety and Shipping Review 2024* (reporting a 70% fall in total losses since 2014), https://commercial.allianz.com/news-and-insights/reports/shipping-safety.html (last visited May 24, 2025).
[109] UNCLOS art. 91.
[110] *Prestige* Oil Spill, 2002, ITOPF, https://www.itopf.org/in-action/case-studies/prestige-spain-france-2002/ (last visited May 11, 2025).
[111] *Spain's Biggest Environmental Disaster: The Prestige Oil Spill 20 Years After*, Euronews (Nov. 14, 2022), https://www.euronews.com/2022/11/14/spains-biggest-environmental-disaster-the-prestige-20-years-after (last visited May 09, 2025).

sparked by the disaster. With far-reaching effects on maritime traffic, this case demonstrates how flag state duty failures can have disastrous environmental and economic repercussions.

Flag states nevertheless have a significant influence on how international maritime regulations are shaped in spite of these obstacles. Vigilant flag nations guarantee strict adherence to labour, environmental, and safety regulations, which greatly enhances the seamless operation of marine trade. Their oversight helps prevent accidents, minimizes disruptions, and enhances confidence among trading partners. Furthermore, flag states provide essential legal clarity: in incidents occurring on the high seas ranging from vessel collisions and pollution events to criminal acts aboard ships, the flag state exercises jurisdiction to investigate and prosecute as necessary. This guarantees that legal procedures control the settlement of maritime disputes and avoids jurisdictional problems between states.

Significant economic ramifications may also result from a flag state's registry's reputation. Shippers, insurers, and port officials frequently evaluate the safety or compliance records of various flags, and boats flying flags with subpar safety or compliance records are frequently reflected in port state control. High detention rates on black lists may result in increased insurance costs, postponed inspections, or complete market exclusion.[112] In sum, those flag states that diligently uphold international maritime law effectively serve as guardians of quality and reliability in global shipping, thereby safeguarding the smooth functioning of international trade.

3.3 Port and Coastal State Jurisdiction

On the high seas, flag states have jurisdiction over ships, but once these ships approach their ports or territorial waters, port states and coastal states take on crucial regulatory responsibilities. Any country where a foreign ship docks to load or unload cargo, refuel, or seek shelter is referred to as a port state. While in port, the rules of the port state are applicable, and crucially, the port state has the power to use a system called Port State Control (PSC) to check that vessels are complying with international norms.

[112] *Paris Memorandum of Understanding on Port State Control: White, Grey and Black List 2024/25*, Paris MoU (July 1, 2024).

PSC has developed into an essential tool for upholding marine agreements, especially those pertaining to environmental preservation and safety. According to UNCLOS Article 218 and the International Convention for the Prevention of Pollution from Ships (MARPOL), port governments have the authority to check foreign ships for pollution infractions, including those that may have happened on the high seas, and to apply sanctions as needed.[113] Through regional frameworks like the Paris Memorandum of Understanding (Paris MoU)[114] in Europe and the Tokyo MoU[115] in the Asia-Pacific, port states collaborate to identify and target sub-standard ships. These regimes maintain centralized databases of inspection outcomes and share information among member states, enabling a coordinated focus on high-risk vessels.

The impact of PSC on international trade has been overwhelmingly positive. Deficient ships are detained until deficiencies are rectified, thereby mitigating the risk of accidents or environmental disasters that could cause significant disruptions to trade. About 1% of foreign vessel entries to U.S. ports have resulted in detentions due to major flaws in recent years, according to the U.S. Coast Guard. This statistic illustrates both the vigilance of port state control and the generally high degree of compliance among ships.[116] On a global scale, the number of detentions remains a small fraction of total port calls, indicating that most vessels adhere to applicable safety and environmental regulations. This high rate of compliance serves as a testament to the effectiveness of maritime law enforcement mechanisms in promoting responsible shipping practices.

The aspects of maritime law that deal with compliance and enforcement are best shown by port state control. It acts as an essential safety net, allowing port governments to step in to safeguard their waters and maintain fair competition among marine companies when a flag state violates its regulatory duties. A notable real-world example of port state intervention is the case of the oil tanker *Erika* (1999). The *Erika*, a Maltese-flagged tanker, fractured in the Bay of Biscay while en route from France, resulting in a

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[113] Michael G. Chalos, *Port State Jurisdiction & Article 218 of UNCLOS*, 10 J. Mar. L. & Com. 113 (1979), https://docs.rwu.edu/cgi/viewcontent.cgi?article=1343&context=law_ma_jmlc (last visited May 13, 2025).
[114] *Paris Memorandum of Understanding on Port State Control*, Jan. 26, 1982, available at https://parismou.org/PMoU-Procedures/Library/memorandum (last visited May 13, 2025).
[115] *Tokyo Memorandum of Understanding on Port State Control in the Asia-Pacific Region*, Dec. 1, 1993, available at https://www.tokyo-mou.org/about/ (last visited May 12, 2025).
[116] U.S. Coast Guard, *Port State Control Annual Report 2023* 1 (2024) (noting a detention rate of approximately 1.22% for foreign vessels calling at U.S. ports).

significant oil spill. Subsequent investigations revealed severe corrosion in the vessel's structure, raising doubts regarding the adequacy of its flag state's oversight.[117]

In the aftermath of the *Erika* disaster, France and several other European states pressed for stricter port state control measures. The European Union responded by implementing directives that banned older single-hull tankers from European ports and increased inspection frequencies for higher-risk vessels.[118] The maritime sector saw significant changes as a result of this collective port state response, which also hastened the introduction of double-hull tanker designs.[119] Consequently, the frequency and severity of oil spills from tankers have dramatically decreased. Estimates suggest that the volume of oil spilled in the 2010s was approximately 95% lower than in the 1970s, despite a marked increase in global trade volume.[120] This decline underscores the crucial role strong port (and flag) state enforcement has played in enhancing the safety and sustainability of maritime commerce.

Coastal states, defined as nations with shorelines adjacent to key shipping routes, also possess specific rights and responsibilities that influence maritime trade. Coastal governments have the power to oversee things like pollution, resource conservation, navigation safety, and customs within their territorial seas, which are up to 12 nautical miles from the baseline. Nonetheless, these rules must not unnecessarily restrict foreign ships' innocent passage rights. To prevent maritime tragedies, coastal states might, for instance, mandate that ships follow specified traffic separation plans or maintain speed limits in critical locations. The IMO frequently works with coastal states to implement such regulations, especially in crowded waterways or Particularly Sensitive Sea Areas (PSSAs) like Australia's Great Barrier Reef, where mandatory pilotage for large vessels has been implemented to protect the environment and navigation.[121]

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[117] Bureau d'Enquêtes sur les Événements de Mer (BEAmer), *Report of the Enquiry into the Sinking of the Erika* (2000), https://www.bea-mer.developpement-durable.gouv.fr/full-report-sinking-of-the-erika-a406.html (last visited May 17, 2025).
[118] European Commission, *Erika I / II / III Legislative Packages*, MEMO/01/387 (Nov. 27, 2001), https://ec.europa.eu/commission/presscorner/detail/en/MEMO_01_387 (last visited May 17, 2025).
[119] *Id.*
[120] Int'l Tanker Owners Pollution Fed'n (ITOPF), *Oil Tanker Spill Statistics 2024* (2025), https://www.itopf.org/knowledge-resources/data-statistics/oil-tanker-spill-statistics-2024/ (last visited May 17, 2025).
[121] International Maritime Organization, *Particularly Sensitive Sea Areas* (2017), https://www.imo.org/en/ourwork/environment/pages/pssas.aspx (last visited May 17, 2025).

Coastal states share responsibility for environmental protection and generally maintain sovereign rights over natural resources (such as fisheries and offshore oil and gas) in the EEZ, which goes till 200 nm off a state's coast. However, coastal states are not allowed to arbitrarily block foreign vessels' passage, and freedom of navigation is still a basic value in the EEZ. However, there are times when coastal nations establish broad regulations that states like the US contend violate UNCLOS norms, such as requiring prior approval for foreign warships transiting their EEZs.

One illustrative conflict concerning coastal state jurisdiction involved Spain's handling of the *Prestige* incident (2002). When the damaged oil tanker *Prestige* drifted into Spain's EEZ, Spanish authorities, concerned about the risk of coastal pollution, ordered the vessel out to sea. This action ultimately contributed to the ship's breakup and the widespread spillage of oil into international waters[122]. A port of refuge needs to have been provided, according to numerous specialists, as the experience revealed conflicts between a coastal state's obligation to safeguard its coastline and the more general requirement of appropriately handling maritime victims. In order to strike a balance between the preservation of coastal habitats and the humanitarian and safety requirements of providing shelter to ships in distress, the IMO responded by adopting more precise standards for places of refuge.[123]

In sum, coastal states are indispensable stakeholders in maintaining the security and stability of maritime trade routes. While they must exercise regulatory powers to protect their own waters and resources, they also bear an international responsibility to uphold navigation freedoms essential to global commerce. Effective cooperation and adherence to established international norms are vital to ensuring that these dual objectives are achieved without unduly disrupting the flow of maritime trade.

3.4 Global Governance: UNCLOS and the IMO

The foundation of maritime law's impact on international trade is made up of the international organizations and structures that regulate the oceans. The most important of them is the 1982 UNCLOS, which is generally accepted as customary international

[122] PBS Frontline/World, *Spain – The Lawless Sea* (Jan. 2004), https://www.pbs.org/frontlineworld/stories/spain/thestory.html (last visited May 17, 2025).
[123] International Maritime Organization (IMO), Guidelines on Places of Refuge for Ships in Need of Assistance, Resolution A.949(23), adopted Dec. 5, 2003.

law and has been ratified by 168 parties as of the mid-2020s. By outlining the rights and responsibilities of governments in each marine zone, internal waters, territorial sea, contiguous zone, EEZ, continental shelf, and high seas, UNCLOS offers a comprehensive legal framework.

UNCLOS eliminates jurisdictional issues that would otherwise impede shipping operations by precisely defining these maritime zones. To prevent coastal governments from asserting overly expansive claims that could impede international navigation, for example, it standardizes the territorial sea's width at up to 12 nm. Additionally, the Convention creates the EEZ system, which allows coastal governments to exercise sovereign rights over natural resources while maintaining universal freedom of navigation. This legal clarity is indispensable for trade as it enables shipping companies to plot routes with confidence, knowing where they must comply with coastal regulations and where they are in international waters.

Apart from its zonal structure, UNCLOS upholds a number of essential ideas that promote marine commerce. While Article 90 upholds each state's right, whether it is a landlocked or coastal state, Article 87 declares the freedom of navigation on the high seas.[124] All of these provisions work together to guarantee that no state can deny others access to the world's oceans. By ensuring passage rights across vital chokepoints under Part III (transit through international straits)[125] and Part IV (archipelagic sea lanes passage)[126], UNCLOS significantly enhances trade.

The situation in the South China Sea, where trillions of dollars' worth of trade transits each year, serves as a striking example of the crucial role these regulations play. China's vast nine-dash line claim was unanimously rejected by an arbitral tribunal in the South China Sea Arbitration (Philippines v. China, 2016), which reaffirmed the concept of freedom of navigation and found that the claim lacked a legitimate foundation under UNCLOS.[127] Given that the South China Sea's sea lanes carry approximately $3.4

[124] UNCLOS, arts. 87, 90.
[125] UNCLOS, arts. 37-44.
[126] UNCLOS, arts. 46-54.
[127] *South China Sea Arbitration (Philippines v. China)*, PCA Case No. 2013–19, Award (July 12, 2016); see also *South China Sea Arbitration Ruling: What Happened and What's Next?*, U.S.-China Economic and Security Review Commission, https://www.uscc.gov/research/south-china-sea-arbitration-ruling-what-happened-and-whats-next (last visited May 13, 2025).

trillion in trade annually amounting to about 21% of global trade[128] upholding UNCLOS principles in such regions is directly linked to preserving the integrity and reliability of international commerce.

Beyond setting substantive rules, UNCLOS also established several institutions to operationalize its principles.[129] The IMO was established in 1948 and went into operation in 1959, but it existed before UNCLOS. The Convention regularly makes reference to the appropriate international body, which in the case of shipping is the IMO. The IMO's primary goals as a specialized agency of the UN are to avoid marine pollution, advance security, and improve maritime safety. Through consensus-driven negotiations, the IMO develops and promulgates international conventions that standardize shipping regulations across jurisdictions.

It is impossible to overestimate the IMO's contribution to global regulatory convergence. International shipping operates according to a set of technical conventions. The International Ship and Port Facility Security (ISPS) Code, which was enacted in the wake of the September 11 attacks, serves as one example. By 2004, the ISPS Code had been adopted as a SOLAS modification and was required for all SOLAS parties. Its rapid, global acceptance raised security standards in all of the major maritime nations at once, averting possible weaknesses and reassuring trading corporations that strong, uniform security measures were in place everywhere.[130]

Additionally, international organizations are essential for promoting collaboration and assisting in the amicable settlement of maritime conflicts. UNCLOS created the International Tribunal for the Law of the Sea (ITLOS), which acts as a venue for resolving disagreements pertaining to the Convention. Ad hoc arbitral tribunals, like the one that rendered a decision in the South China Sea Arbitration, and ITLOS work together to settle disputes that may otherwise worsen and impede trade.

For example, flag nations can ensure the quick release of detained boats and personnel under ITLOS's swift release procedure, usually in situations involving pollution or

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[128] *How Much Trade Transits the South China Sea?*, ChinaPower Project, Center for Strategic & International Studies, https://chinapower.csis.org/much-trade-transits-south-china-sea/ (last visited May 14, 2025).
[129] Thomas J. Schoenbaum, *Admiralty and Maritime Law* § 2:1 (6th ed. 2022).
[130] International Maritime Organization, *SOLAS XI-2 and the ISPS Code*, https://www.imo.org/en/OurWork/Security/Pages/SOLAS-XI-2%20ISPS%20Code.aspx (last visited May 15, 2025).

fisheries infractions, by paying a reasonable bond. This mechanism was effectively employed in the *MV Saiga* case (1997, St. Vincent and the Grenadines v. Guinea), where an oil tanker and its crew were swiftly released following a dispute over fuel smuggling regulations.[131] In a similar way, ITLOS ordered the release of an Argentine naval vessel that had been detained in a Ghanaian port in the ARA Libertad case (2012, Argentina v. Ghana), highlighting the need to prevent conflicts from needlessly delaying maritime activities.[132] These judicial remedies help maintain the smooth flow of maritime trade by minimizing protracted detentions and legal uncertainties.

The governance structure set up by the IMO and UNCLOS is supplemented by other international organizations. The Maritime Labour Convention (MLC), 2006, which establishes international standards for the rights, working circumstances, and welfare of seafarers, was largely adopted thanks to the International Labour Organization (ILO).[133] Ensuring decent labour conditions aboard ships helps maintain a stable workforce and reduces disruptions such as strikes or vessel detentions, indirectly facilitating smoother trade operations.

Meanwhile, the World Trade Organization (WTO), although not directly regulating shipping, plays an ancillary role by liberalizing trade in goods and discouraging arbitrary restrictions on commerce. For example, WTO rules would disapprove of a country imposing unjustified bans on foreign goods arriving by sea without a legitimate health or security rationale.

Additionally, forums like the International Maritime Bureau (IMB), an arm of the International Chamber of Commerce serve critical functions in monitoring maritime piracy and commercial fraud.[134] By sharing intelligence and supporting enforcement actions, these entities further bolster the security of maritime trade routes.

In conclusion, UNCLOS and the IMO provide the overarching governance framework for the maritime domain, achieving near-universal acceptance. UNCLOS supplies the foundational legal principles, while the IMO develops the operational conventions and

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[131] *M/V Saiga* (St. Vincent v. Guinea), Case No. 1, Judgment of Dec. 4, 1997, 1 ITLOS Rep. 16.
[132] *The "ARA Libertad" Case* (Argentina v. Ghana), Provisional Measures, Case No. 20, Order of Dec. 15, 2012, ITLOS Rep. 2012, at 332.
[133] *See* Int'l Transp. Workers' Fed'n, *An ITF Guide for Seafarers to the ILO Maritime Labour Convention, 2006* (2017).
[134] ICC Int'l Maritime Bureau, *Piracy Reporting Centre*, https://icc-ccs.org/imb-piracy-reporting-centre-2/ (last visited May 25, 2025).

standards that ensure uniformity across the global shipping industry. Through these structures, the international community has fostered a remarkably coherent legal environment for maritime trade, one that is essential for maintaining an open, secure, and efficient global economy. The following section will explore the specific international maritime conventions in greater detail to demonstrate their practical application to global commerce.

3.5 Key International Maritime Conventions in Global Commerce

The international community has created a number of legal tools throughout the last century, which together serve as the foundation for contemporary marine operations and, consequently, international trade. These international conventions establish a standardized framework that governs the construction, operation, and regulation of commercial vessels. Their principal achievement lies in harmonizing expectations across jurisdictions, ensuring that ships and their cargoes are subject to consistent legal treatment regardless of where they sail. What follows is an examination of the most pivotal conventions and their contribution to international commerce.

- UNCLOS (1982)

UNCLOS lays out the fundamental legal framework regulating the oceans and is frequently referred to as the umbrella document for all maritime law. It covers a wide range of topics, including as maritime boundary delineation, marine resource exploitation, seabed mining, navigation rights, and marine environmental protection.[135] Its dedication to maintaining freedom of navigation and settling maritime disputes is essential to global trade. Interestingly, Articles 94 and 211 integrate many IMO conventions into the UNCLOS legal framework by requiring governments to pass domestic legislation that guarantees ships flying their flags follow international safety and pollution control requirements.[136]

[135] *U.N. Convention on the Law of the Sea*, Dec. 10, 1982, 1833 U.N.T.S. 397
[136] UNCLOS arts. 94, 211

- SOLAS (1974)

The most extensive international convention pertaining to maritime safety is still the SOLAS Convention, which was first motivated by the Titanic catastrophe in 1912.[137] It establishes necessary regulations for ship design, including as the use of fire-retardant materials, life-saving gear, watertight bulkheads, and navigational technologies like GPS and radar. The International Ship and Port Facility Security (ISPS) Code, which is a crucial component of SOLAS, requires ships and port facilities to adhere to security requirements in order to reduce risks like terrorism and piracy. Compliance with SOLAS is typically a precondition for entry into most international ports; vessels without valid certificates risk detention or denial of access, effectively barring them from international trade routes.

- MARPOL (1973/1978)

MARPOL is the primary international treaty governing the environmental performance of ships.[138] It regulates the release of airborne pollutants, sewage, waste, oil, and toxic substances. Sulfur and nitrogen oxide emissions from ship exhaust are expressly limited by Annex VI, which was added later. The IMO 2020 sulfur cap, which lowered the allowable sulfur concentration in marine gasoline from 3.5% to 0.5% globally, was a historic MARPOL breakthrough.[139] Though the rule required significant investment in cleaner fuel and technology, the maritime industry achieved over 95% compliance within its first year demonstrating the power of unified regulation to drive substantial environmental and operational change.[140]

- STCW (1978, as amended) – Standards of Training, Certification and Watchkeeping for Seafarers

This convention establishes minimum standards for sailors' certification and training on a global basis. By requiring uniform qualifications, STCW ensures that crews from

[137] *International Convention for the Safety of Life at Sea (SOLAS)*, Nov. 1, 1974, 1184 U.N.T.S. 278.
[138] *International Convention for the Prevention of Pollution from Ships*, Nov. 2, 1973, as modified by the Protocol of 1978, 1340 U.N.T.S. 184.
[139] Int'l Maritime Org. [IMO], *Report of the Marine Environment Protection Committee on its Seventy-Fifth Session*, MEPC 75/18 (Nov. 2020).
[140] Int'l Mar. Org., *IMO 2020 Fuel Oil Sulphur Limit* (Jan. 1, 2020), https://www.imo.org/en/MediaCentre/HotTopics/Pages/Sulphur-2020.aspx (last visited May 25, 2025).

different nations meet comparable safety and operational standards.[141] For global trade, this enhances predictability and trust: cargo owners and port authorities can rely on the competence of crews regardless of nationality. Furthermore, port states may detain ships with inadequately trained crews, making STCW compliance a practical necessity for international operators.

- MLC (2006) – Maritime Labour Convention

Along with SOLAS, MARPOL, and STCW, the MLC, 2006, is frequently referred to as the "fourth pillar" of maritime regulation. It updates and unifies earlier International Labour Organization agreements on living and working conditions onboard ships.[142] It addresses a broad spectrum of labour concerns, including minimum age, employment terms, rest hours, medical care, accommodation, and repatriation rights. While primarily labour-oriented, its impact on trade is significant: better working conditions reduce the risk of crew fatigue, mutiny, or strike-related disruptions. To further strengthen international enforcement, the MLC also gives port nations the authority to examine foreign boats and detain those that do not adhere to the necessary criteria.

- COLREGs (1972) – Convention on the International Regulations for Preventing Collisions at Sea

This convention functions as the maritime world's "rules of the road." It standardizes steering, signalling, and right-of-way procedures to prevent collisions at sea.[143] With near-universal adoption, COLREGs ensure that ships from vastly different jurisdictions operate according to the same navigational rules, critical for minimizing risks in congested international waters. The result is greater operational predictability and fewer costly or deadly incidents that could impede port access or block vital sea lanes.

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[141] *See International Convention on Standards of Training, Certification and Watchkeeping for Seafarers*, July 7, 1978, 1361 U.N.T.S. 2.
[142] Int'l Labour Org*., Maritime Labour Convention, 2006 (*"fourth pillar"), https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@ed_norm/@normes/documents/presentation/wcms_229914.pdf (last visited May 20, 2025).
[143] *See Convention on the International Regulations for Preventing Collisions at Sea*, Oct. 20, 1972, 1050 U.N.T.S. 16.

- FAL Convention (1965) – Convention on Facilitation of International Maritime Traffic

While less well-known than the safety or environmental treaties, the FAL Convention plays a crucial administrative role by simplifying and standardizing port documentation.[144] It reduces bureaucratic barriers to entry by harmonizing forms such as cargo manifests, crew lists, and customs declarations. In recent years, the convention has evolved to support digital processes encouraging single-window electronic submission systems that enhance port efficiency and reduce turnaround times, thereby accelerating the pace of global supply chains.

- International Conventions on the Carriage of Goods by Sea

The rights and obligations of carriers with regard to cargo are governed by a number of legal instruments. These consist of the Rotterdam Rules (2008)[145], the Hamburg Rules (1978)[146], the Hague-Visby Protocol (1968)[147], and the Hague Rules (1924)[148]. They all serve as the foundation for standard liability regimes, even though not all of them are commonly used. For example, carriers are responsible for cargo loss or damage under Hague-Visby unless they can demonstrate due diligence; liability is normally limited to 666.67 Special Drawing Rights (SDRs) per package.[149] The harmonization of such rules facilitates the global cargo insurance market and provides clarity for dispute resolution, an essential feature for commercial predictability.

- LLMC (1976, as amended) – Convention on Limitation of Liability for Maritime Claims

If there is no deliberate misbehaviour involved, the LLMC allows shipowners to minimize their financial obligation for claims resulting from maritime incidents, such as damage to cargo or third-party property.[150] This principle, rooted in 19th-century

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[144] *See Convention on Facilitation of International Maritime Traffic,* Apr. 9, 1965, 591 U.N.T.S. 265.
[145] *United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea*, Dec. 11, 2008
[146] *United Nations Convention on the Carriage of Goods by Sea*, Mar. 31, 1978, 17 I.L.M. 603 (1978)
[147] *Protocol to Amend the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading*, Feb. 23, 1968, 1412 U.N.T.S. 127.
[148] *International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading*, Aug. 25, 1924, 120 L.N.T.S. 155.
[149] Weightmans LLP, *What Is a "Package" Under the Hague-Visby Rules?* (Aug. 2017), https://www.weightmans.com/insights/what-is-a-package-or-unit-for-limitation-purposes-under-hague-visby-rules/ (last visited May 11, 2025).
[150] *Convention on Limitation of Liability for Maritime Claims*, Nov. 19, 1976, 1456 U.N.T.S. 221.

commercial practice, is vital for risk management in shipping. The LLMC promotes investment and involvement in international shipping by allowing owners to set up limitation funds based on a ship's tonnage, assuring stakeholders that catastrophic liability would not beyond insurable norms.

- Salvage and General Average

Although not public international conventions in the strict sense, both the International Convention on Salvage (1989) and the long-established principle of General Average (GA), as codified in the York-Antwerp Rules, are fundamental to commercial maritime practice. Salvage law incentivizes private actors to rescue ships and cargo in distress by offering financial rewards, including additional compensation for protecting the marine environment.[151] General Average, by contrast, distributes losses from voluntary sacrifices such as jettisoning cargo or incurring salvage expenses among all parties in the maritime venture. The *Ever Given* event in 2021, in which a vessel stopped the Suez Canal for six days, is a contemporary example of GA in action. Before the cargo owners' items could be released, they had to pay a portion of the multimillion-dollar salvage costs once the owners declared General Average.[152] The *Ever Given's* stranding affected an estimated $9.6 billion in daily worldwide trade, and it carried cargo valued at an estimated $700 million.[153] The use of maritime principles like salvage and GA has helped to be resolve this in an effective way, avoiding delayed litigations.

3.6 Conclusion

Global maritime commerce is supported by a strong, interconnected legal framework made up of numerous conventions and legal doctrines. They include specific technical and administrative regulations like those in SOLAS, MARPOL, and the FAL Convention, as well as high-level principles like the freedom of navigation guaranteed by UNCLOS. Together, they lower transaction costs, improve predictability and safety, and level the playing field for global operators. The smooth operation of the global

[151] *International Convention on Salvage*, Apr. 28, 1989, 1953 U.N.T.S. 193.
[152] Jonathan Amos, *Ever Given: How the Suez Canal Incident Disrupted Global Trade*, BBC News (Mar. 29, 2021), https://www.bbc.com/news/business-56559073 (last visited May 15, 2025).
[153] Justin Harper, *Suez Blockage Holding Up $9.6 Billion of Goods a Day*, BBC News (Mar. 12, 2021), https://www.bbc.com/news/business-56533250 (last visited May 11, 2025).

economy depends on this regulatory coherence, which is not just desirable in a world where more than 80% of global trade by volume is carried out by sea.

CHAPTER 4: CONTEMPORARY CHALLENGES IN MARITIME LAW

4.1 Climate Change and Environmental Responsibilities in Shipping

In recent years, maritime law has been compelled to confront an increasingly urgent challenge: the global climate crisis and its implications for ocean governance. Comprising an estimated 2 to 3 percent of world carbon dioxide (CO_2) emissions, the shipping industry integral to worldwide trade is now acknowledged as a major greenhouse gas (GHG) offender. This growing awareness has put pressure on the maritime sector to shift toward greener operations and more closely match UN climate change reducing targets. In a significant first toward this goal, the IMO presented its Initial Strategy on the Reduction of GHG emissions from ships in 2018.[154] Relative to 2008 levels, this strategy sought to reduce emissions by at least 50 percent by 2025.

However, given the escalating urgency of climate-related issues, the strategy was significantly revised in July 2023. Complementing intermediate benchmarks of a 20-30 percent reduction by 2030 and a 70-80 percent reduction by 2040, the new aims now aim at net-zero emissions by or around mid-century.[155] These targets represent not only technical and economic challenges for ship operators and flag States but also reflect a normative shift toward greater environmental accountability, even though the Paris Agreement itself does not explicitly regulate maritime emissions.[156] The IMO's interventions, therefore, play a vital role in bridging this gap, though they must delicately balance the differing capacities and responsibilities of developed and developing nations.

The International Convention for the Prevention of Pollution from Ships, or MARPOL, is a cornerstone of the legal response to maritime pollution. Adopted in 1973 and later revised by a 1978 Protocol, the Convention was drafted in reaction to devastating oil

[154] Int'l Mar. Org., *Initial IMO Strategy on Reduction of GHG Emissions from Ships*, IMO Doc. MEPC 72/17/Add.1, Annex 11 (Apr. 13, 2018).
[155] Int'l Mar. Org., *Initial IMO Strategy on Reduction of GHG Emissions from Ships*, IMO Res. MEPC.304(72) (Apr. 13, 2018)
[156] Int'l Mar. Org., *2023 IMO Strategy on Reduction of GHG Emissions from Ships*, https://www.imo.org/en/MediaCentre/PressBriefings/pages/Revised-GHG-reduction-strategy-for-global-shipping-adopted-.aspx (last visited May 15, 2025).

spills in the early 1970s.[157] It currently consists of six comprehensive annexes that control several types of marine pollution, such as air emissions, sewage, waste, packaged hazardous materials, noxious liquids, and oil discharges. Over the decades, MARPOL has spurred critical innovations in maritime technology, such as the development of double-hulled tankers and the adoption of cleaner fuels.

Under Annex VI, one particularly significant change went into effect in 2020 and required a worldwide cap of 0.5 percent sulfur content in marine fuels. By drastically reducing sulfur oxide emissions from ships, this action improved the quality of the air in port cities and along shipping lanes. Yet, the treaty's original structure did not envisage the contemporary challenge of GHGs, prompting ongoing amendments to address this evolving threat. The IMO's Fourth GHG Study (2020) found that by 2018, the sector's CO_2 emissions had risen to nearly 2.9 percent of global totals an alarming trend that emphasized the need for more aggressive regulatory intervention.[158] Consequently, policy discussions have increasingly focused on market-based measures and carbon intensity standards. However, any such frameworks must also navigate the principle of common but differentiated responsibilities, which remains a cornerstone of international environmental law. If large flag States fail to adopt or enforce decarbonization standards, the resulting disparities may undermine both environmental objectives and fair competition within the global shipping market.

To better understand the gap between ambition and readiness, recent data from DNV's 2024 Maritime Forecast to 2050 offers timely insight into fuel supply and vessel trends.[159]

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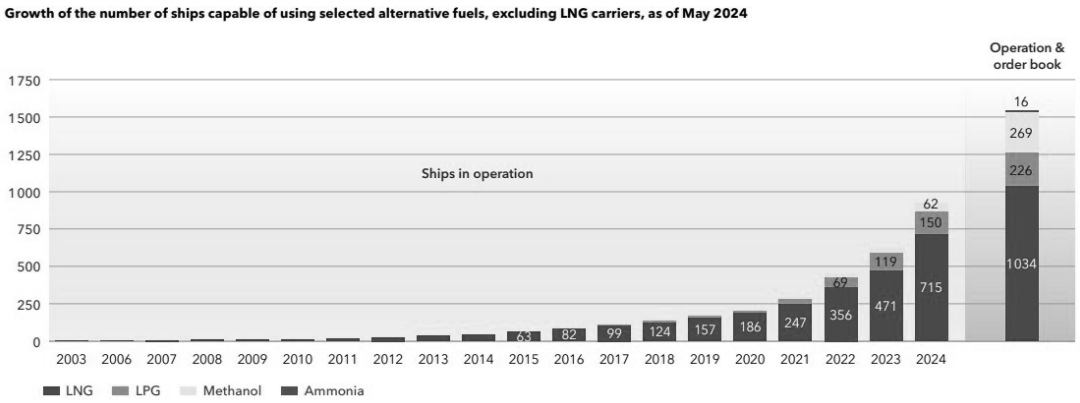
[157] *International Convention for the Prevention of Pollution from Ships*, Nov. 2, 1973, 1340 U.N.T.S. 184, as amended by Protocol of 1978 Relating Thereto, 1340 U.N.T.S. 61 (entered into force Oct. 2, 1983)

[158] *See* Int'l Mar. Org. [IMO], *Fourth IMO Greenhouse Gas Study 2020* (2020), https://www.imo.org/en/OurWork/Environment/Pages/Fourth-IMO-Greenhouse-Gas-Study-2020.aspx.

[159] DNV, *Maritime Forecast to 2050: Energy Transition Outlook 2024* (2024), https://www.dnv.com/publications/maritime-forecast-2024-edition/ (last visited May 22, 2025).

Figure 1



Source: DNV Energy Transition Outlook 2024 - Maritime Forecast to 2050

Recent analysis by DNV (2024) shows that shipping is beginning to shift towards cleaner fuels, but the transition is still in its early stages. As of mid-2024, more than 1,000 vessels can operate on LNG, while methanol- and LPG-capable ships are growing in number. Ammonia-fuelled ships are also starting to appear in order books, though they are not yet in widespread use. However, the availability of carbon-neutral fuels is expected to fall short of future demand. By 2030, shipping alone could need up to 48 million tonnes of oil equivalent, while total global supply may only reach 44-63 million tonnes. In other words, shipping could end up consuming almost all available carbon-neutral fuel unless other sectors decarbonise faster or shipping significantly improves its energy efficiency. This highlights two urgent priorities: making ships more energy efficient in the short term and accelerating investment in low and zero-carbon fuel production. Without action on both fronts, meeting the IMO's climate targets will be extremely difficult.[160]

Parallel to GHG emissions, another ecological challenge lies in the unintentional transfer of invasive aquatic species via ballast water. Vessels routinely take on ballast water to maintain stability during voyages, but upon release at the destination port, this water may contain non-native marine organisms. Once introduced, these species can devastate local ecosystems and economies, a notable example being the spread of zebra mussels across North American waterways.

[160] *Id.*

Adopted in 2004, the Ballast Water Management (BWM) Convention was ratified in order to reduce this risk, and it became operative in 2017.[161] Two main standards are established by the Convention: the more demanding D-2 standard for onboard treatment systems and the D-1 standard for ballast water exchange. Implementation, however, has been anything but straightforward. Many shipowners encountered substantial technical and financial hurdles in retrofitting their vessels with compliant treatment systems, which can cost millions of dollars per unit. In light of these challenges, the IMO provided phased enforcement schedules and issued supplementary guidelines to facilitate compliance.

The success of this regulatory framework hinges heavily on port State control mechanisms, as enforcement by flag States remains inconsistent especially in jurisdictions with limited administrative capacity. As of 2021, over 85 States, representing more than 90 percent of the global fleet, had ratified the BWM Convention.[162] This widespread adherence suggests a normative consensus on the need to prevent ecological harm from ballast water discharges. Nonetheless, significant questions persist regarding how to enforce the Convention against non-Party States and how to drive continuous innovation in ballast water treatment technology. The Convention embodies the "prevention is better than cure" ethos aiming to address environmental threats at their source before irreparable damage occurs.

The wider existential threats posed by climate change, especially sea level rise, must therefore be addressed by maritime law in addition to these operational rules. This phenomenon has the potential to redefine national coasts, which would have an effect on the legal baselines used to measure maritime zones such continental shelf, territorial seas, and EEZs. These areas are defined by baselines, usually the low-water line along the coast, in accordance with the UNCLOS.[163] A literal interpretation of UNCLOS would suggest that rising sea levels could shrink or even erase maritime entitlements, especially for low-lying island nations.

Countries particularly vulnerable to these changes such as those in the Pacific face the dire possibility of losing both land and the marine resources legally attached to them.

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[161] *International Convention for the Control and Management of Ships' Ballast Water and Sediments*, Feb. 13, 2004, Int'l Mar. Org., IMO Doc. BWM/CONF/36.
[162] *Id.*
[163] *UNCLOS* art. 5.

In response, legal and policy discourse has shifted toward preserving maritime zones despite the physical transformation of coastlines. In 2018, the International Law Association proposed a resolution advocating for the permanence of maritime boundaries once properly established, regardless of subsequent sea-level rise. The International Law Commission has also launched a study into this issue, garnering broad support for the idea that legal certainty and equity demand a freezing of current baselines.[164] Similarly, in 2021, the Pacific Island States adopted a joint declaration stating that their notified marine zones would not be affected by future alterations to the coast.[165] While not yet formalized in a binding international treaty, these developments suggest an emerging customary norm designed to uphold the legal rights of vulnerable nations amidst climate change. This trend illustrates how established legal frameworks like UNCLOS must be interpreted flexibly and pragmatically to meet evolving environmental realities.

Finally, the drive for sustainability in shipping has spurred numerous regional regulatory initiatives, some of which have outpaced global consensus. The European Union, for example, has taken steps to enforce targeted efficiency criteria on vessels entering EU ports and to incorporate maritime emissions in its Emissions Trading Scheme. While these steps demonstrate regional leadership, they also risk fragmenting the regulatory landscape. The divergence between regional and international standards has raised concerns among shipowners, who fear a proliferation of conflicting rules that could undermine the IMO's central coordinating role.

The ideal trajectory would be a harmonized international framework that maintains uniformity while encouraging innovation. However, the slow pace of consensus-building at the global level may prompt further regional divergence. Maritime law, therefore, faces the delicate task of integrating these disparate approaches without fracturing its foundational principles. Treaties like UNCLOS and MARPOL have shown themselves capable of adaptation, but new conditions will likely necessitate additional protocols or interpretive instruments under IMO auspices.

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[164] International Law Commission, *Sea-Level Rise in Relation to International Law*, U.N. Doc. A/CN.4/740 (2020), available at https://legal.un.org/ilc/guide/8_9.shtml.

[165] *Declaration on Preserving Maritime Zones in the Face of Climate Change-related Sea-Level Rise*, Pacific Islands Forum Secretariat (Aug. 6, 2021), https://forumsec.org/publications/declaration-preserving-maritime-zones-face-climate-change-related-sea-level-rise.

In sum, the environmental dimension of maritime law is undergoing rapid transformation. As the climate crisis escalates, the resilience of existing treaties and the ability of international institutions to respond proactively will determine the sustainability of global shipping in the decades ahead.

4.2 Maritime Security and Piracy: Evolving Threats

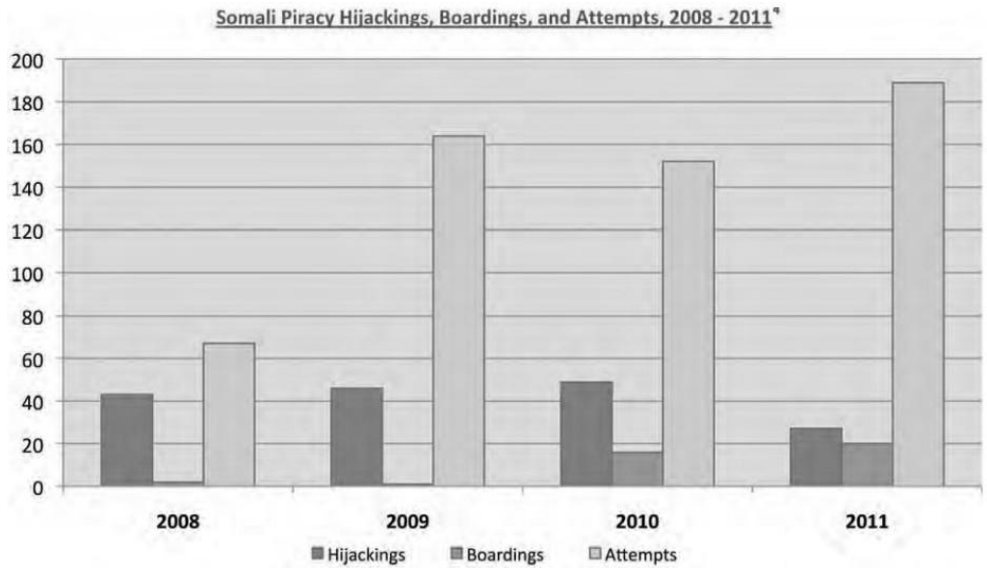
One of the most important legal and geopolitical issues facing the connected world of today is maintaining the safety and integrity of marine commerce routes. Piracy used to seem like a thing of the past, but the last 20 years have shown that it is not. Armed maritime assaults, especially those off the Horn of Africa, have significantly resurfaced in international discourse, necessitating creative operational and legal solutions.

Early in the twenty-first century, Somalia's waters which are geographically close to the Gulf of Aden, a crucial chokepoint between the Indian Ocean and Red Sea became the centre of contemporary maritime piracy. Using the political void created by Somalia's internal disintegration, organized pirate networks boldly raided commercial ships passing through the area. With more than 200 attacks carried out by Somali pirates in 2011 alone, this problem has become out of control. Between 2005 and 2012, the world economy was projected to have lost $18 billion a year as a result of ships being seized, cargo being looted, and sailors being taken hostage.[166]

[166] *The Economic Cost of Somali Piracy 2011*, Oceans Beyond Piracy, One Earth Future Found. 5 (2012), https://oneearthfuture.org/sites/default/files/documents/publications/ECOP%20Full%20Report%202011_0.pdf.

Somali Piracy Hijackings, Boardings, and Attempts, 2008-2011[167]

Figure 2

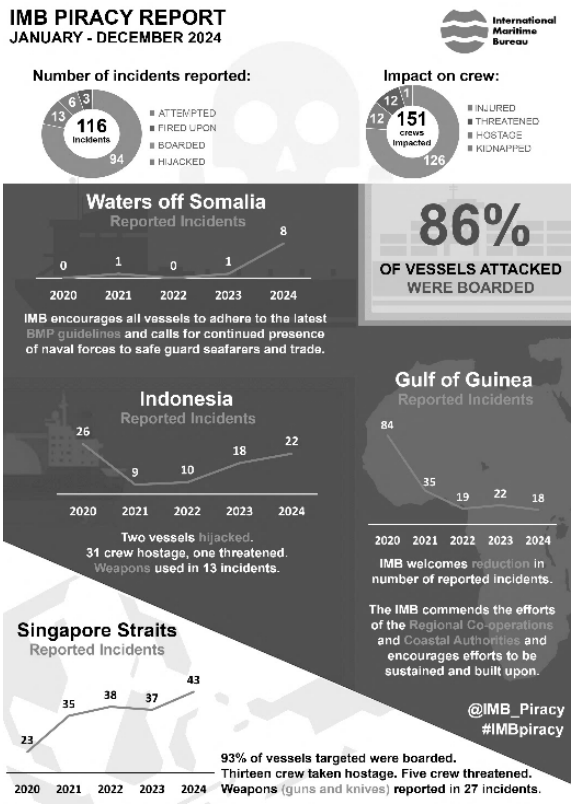


These incidents demonstrated that piracy is a direct threat to international trade, marine safety, and human life and is not just a criminal problem.

[167] *Oceans Beyond Piracy*, *The Economic Cost of Somali Piracy 2011*, One Earth Future Foundation (2011), https://oneearthfuture.org/sites/default/files/documents/publications/ECOP%20Full%20Report%202011_0.pdf (last visited May 25, 2025).

Maritime Piracy and Crew Safety in 2024[168]

Figure 3



Source: ICC Commercial Crime Services (CSS)

In 2024, reported piracy and armed robbery incidents at sea slightly declined to 116 from 120 the previous year. However, threats to crew safety increased, with hostage situations rising significantly. The Gulf of Guinea, despite fewer attacks, remained the primary location for crew kidnappings. Southeast Asia, particularly the Singapore Straits, saw a rise in incidents, often involving armed boardings at night. Meanwhile, Somali piracy re-emerged with hijackings reported off East Africa. The ICC IMB highlights that while overall figures are down, the growing violence against seafarers calls for continued vigilance and global cooperation.[169]

Article 101 of the UNCLOS, which codifies international law, provides a somewhat limited definition of piracy. It includes unlawful detentions, acts of violence, and depredations carried out for personal gain on the high seas, in regions beyond of state

[168] *ICC International Maritime Bureau*, *Maritime Piracy Dropped in 2024 but Crew Safety Remains at Risk* (Apr. 17, 2025), https://icc-ccs.org/maritime-piracy-dropped-in-2024-but-crew-safety-remains-at-risk/ (last visited May 25, 2025).
[169] *Id.*

authority, and typically by private players.[170] This limitation is critical: it means piracy, as defined in UNCLOS, can only be prosecuted under universal jurisdiction if it occurs beyond national waters. Attacks within a country's territorial sea are classified instead as armed robbery at sea, which must be handled by the relevant coastal State.

The Somali piracy crisis blurred these jurisdictional distinctions. Pirate groups often launched operations from land bases within Somalia and attacked vessels both in international waters and within Somalia's territorial seas.[171] Compounding the problem was the absence of a functioning Somali state, which meant there was little to no domestic enforcement. The UN Security Council responded by passing a number of exceptional resolutions, starting with Resolution 1816 (2008).[172] These resolutions, which were made in accordance with Chapter VII of the U.N. Charter, permitted foreign naval troops to operate on Somali territory and even into Somalia's territorial waters in order to combat piracy, as long as the Transitional Federal Government agreed.[173] This legal mechanism was unprecedented and temporarily expanded enforcement authority beyond what UNCLOS would ordinarily allow.

Operation Ocean Shield by NATO, Operation Atalanta by the European Union, and other ad hoc coalitions were among the subsequent coordinated responses.[174] These multinational fleets patrolled high-risk areas, escorted vulnerable merchant ships, and carried out pre-emptive actions against pirate vessels and supply bases. The impact was significant: by 2013, piracy incidents off Somalia had drastically declined, and by 2015-2016, successful hijackings were virtually non-existent.[175] Despite some small comeback efforts in 2024, the Indian Ocean High Risk Area classification was formally revoked in 2023 in appreciation of this ongoing accomplishment.[176]

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[170] UNCLOS art. 101.
[171] Eugene Kontorovich, *International Legal Responses to Piracy off the Coast of Somalia*, 13 ASIL Insights (Feb. 6, 2009), https://www.asil.org/insights/volume/13/issue/2/international-legal-responses-piracy-coast-somalia (last visited May 19, 2025).
[172] S.C. Res. 1816, para. 7, U.N. Doc. S/RES/1816 (June 2, 2008)
[173] *Id.*
[174] NATO, *Operation Ocean Shield*, https://www.nato.int/cps/en/natohq/topics_48815.htm (last visited May 20, 2025).
[175] *See* International Maritime Organization, *Reports on Acts of Piracy and Armed Robbery Against Ships: Annual Report 2013*, MSC.4/Circ.208 (Mar. 1, 2013).
[176] *Shipping Industry to Remove the Indian Ocean High Risk Area*, Int'l Chamber of Shipping, Press Release (Aug. 22, 2022), https://www.ics-shipping.org/press-release/shipping-industry-to-remove-the-indian-ocean-high-risk-area/.

Despite these operational victories, a persistent legal question emerged: what should be done with captured pirates? Many naval forces were initially reluctant to detain suspects due to jurisdictional uncertainties and logistical complications surrounding trial and detention. Since there was no international piracy tribunal, states turned to regional solutions. With assistance from the European Union and the United Nations, countries such as Kenya, Seychelles, and Mauritius decided to bring criminal charges against suspected pirates in their own courts.[177] Countries like the United States and the United Kingdom sent detainees to be tried in Mombasa courts and other places under bilateral arrangements.[178]

Historic cases such as United States v. Dire, where the U.S. Court of Appeals for the Fourth Circuit ruled that attempted piracy defined by UNCLOS as an attack with violent intent on the high seas qualified as piracy even in the absence of successful robbery or hijacking, strengthened the legitimacy of these prosecutions.[179] This case demonstrated the scope of anti-piracy legislation and validated the direct integration of international definitions into national legal frameworks.

Simultaneously, the shipping industry began implementing robust self-protection measures. The adoption of Best Management Practices (BMPs) included defensive modifications like deck barriers, water cannons, and evasive navigation.[180] Increasingly, vessels also employed armed private security personnel, a practice that, while effective in deterring attacks, introduced new legal uncertainties.[181] Unresolved concerns include the proper use of force, possible civil responsibility for wrongful deaths, and the lack of a uniform legislative framework for private military contractors operating in the maritime sector.

Other places have continued to experience marine violence, even while the Somali piracy issue has subsided. Ship attacks, particularly those that target oil tankers and involve crew kidnappings, have been common in the Gulf of Guinea, which is located off the coast of West Africa. Unlike Somali piracy, these incidents often occur within

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[177] Milena Sterio, *Piracy Off the Coast of Somalia: The Argument for Pirate Prosecutions in the National Courts of Kenya, The Seychelles, and Mauritius*, 4(2) Amsterdam L. F. 104 (2012).
[178] *Id.*
[179] *United States v. Dire*, 680 F.3d 446, 451–54 (4th Cir. 2012).
[180] *Best Management Practices to Deter Piracy and Enhance Maritime Security (BMP5)*, BIMCO, ICS, IGP&I Clubs, INTERTANKO & OCIMF (June 2018), https://www.maritimeglobalsecurity.org/media/1038/bmp5-high_res.pdf (last visited May 25, 2025).
[181] *Id.*

territorial waters, which complicates international intervention due to sovereignty concerns. West African nations responded by enacting the Yaoundé Code of Conduct (2013), which aims to improve maritime law enforcement capabilities by promoting regional cooperation and intelligence sharing.[182]

Due to cooperative patrols and concerted legal action by littoral states, piracy in Southeast Asia, which was previously a problem in the Strait of Malacca, has significantly decreased. However, these improvements remain vulnerable to political shifts and resource limitations.

Houthi Attacks in the Red Sea (2023)

By attacking commercial ships directly in the Red Sea and Bab el-Mandeb Strait in late 2023, the Houthi rebel movement in Yemen extended its influence into maritime territories. Armed Houthi commandos seized and took control of the Bahamas-flagged cargo ship *Galaxy Leader* on November 19, 2023, and imprisoned 25 crew members.[183] Targeting international trade networks under the pretense of political solidarity with Palestinians in Gaza, this conduct represented a dramatic change in the threat profile.[184]

Following weeks of missile and drone strikes by Houthi militants against ships they associated with Israel or its backers, several large shipping companies, notably Maersk and Hapag-Lloyd, suspended operations in the Red Sea and rerouted around the Cape of Good Hope.[185] The attacks severely slowed maritime trade flows by disrupting traffic in the Suez Canal and driving up insurance premiums.

Importantly, these actions do not cleanly fit the legal definition of piracy as stated in UNCLOS Article 101, which stipulates that actions must be carried out on the high seas and for private purposes.[186] Legal actions under the piracy framework were limited

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[182] *Code of Conduct Concerning the Repression of Piracy, Armed Robbery Against Ships, and Illicit Maritime Activity in West and Central Africa*, June 25, 2013, Yaoundé, Cameroon.
[183] Jon Gambrell, *Yemen's Houthi Rebels Seize Cargo Ship in Red Sea*, Associated Press (Nov. 20, 2023), https://apnews.com/article/yemen-houthi-rebels-galaxy-leader-crew-3638ab8e31c9c97b2ef5f9079dfbb6c0 (last visited May 21, 2025).
[184] BBC News, *Who Are the Houthis and Why Is the US Targeting Them?*, BBC News (Mar. 21, 2025), https://www.bbc.com/news/world-middle-east-67614911 (last visited May 21, 2025).
[185] Jasper Jolly, *More than 100 Container Ships Rerouted from Suez Canal to Avoid Houthi Attacks*, THE GUARDIAN (Dec. 20, 2023), https://www.theguardian.com/business/2023/dec/20/more-than-100-container-ships-rerouted-suez-canal-red-sea-houthi-attacks-yemen (last visited May 21, 2025).
[186] *United Nations Convention on the Law of the Sea* art. 101, Dec. 10, 1982, 1833 U.N.T.S. 3.

because the Houthis operated in territorial waters and claimed political motivations. According to analysts and retired naval officers, these occurrences were more akin to hybrid warfare or maritime terrorism. In order to better confront politically motivated violence at sea, proposals to broaden the application of legal mechanisms such as the SUA Convention grew as the attacks persisted.[187]

Not all maritime threats fit neatly within the definition of piracy under UNCLOS. For instance, politically motivated acts, including attacks by or on behalf of states, are classified differently, typically under the headings of maritime terrorism or acts of war. This legal grey area was vividly illustrated during the 2019 incidents in the Strait of Hormuz, where several commercial tankers were targeted, allegedly by state-affiliated operatives. The freedom of travel through this strategically important corridor, which transports around 20% of the world's oil supply, was seriously threatened by these acts, even though they were not piracy per se.[188]

Vessels have the right of transit passage through international straits, such as the Strait of Hormuz, in accordance with UNCLOS. With the exception of restricted safety or environmental laws, coastal states are not allowed to impede travel or impose discriminatory conditions.[189] Although the United States has not joined the Convention, it views transit passage as customary international law. In contrast, Iran, which shares a border with Oman, has signed but not ratified UNCLOS and demands advance notice for foreign warships. Iran threatened to close the strait in 2019 as geopolitical tensions increased, which prompted U.S. Navy forces to take countermeasures and conduct freedom of navigation patrols.[190] According to legal experts, such a blockade would be illegal under both treaty and customary law. One such expert is Nilufer Oral, who writes for the American Society of International Law (ASIL).[191]

The British-flagged *Stena Impero*'s capture and the fallout from the U.S. execution of Iranian General Qasem Soleimani in early 2020 put the region on edge even though a

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[187] *Letter from the Permanent Representative of the United States to the United Nations to the President of the Security Council*, U.N. Doc. S/2023/1002 (Dec. 15, 2023).
[188] *The Strait of Hormuz Is the World's Most Important Oil Transit Chokepoint*, U.S. Energy Info. Admin. (June 27, 2023), https://www.eia.gov/todayinenergy/detail.php?id=61002.
[189] UNCLOS arts. 37–44.
[190] Nilufer Oral, *Transit Passage Rights in the Strait of Hormuz and Iran's Threats to Block the Passage of Oil Tankers*, ASIL Insights, Vol. 16, Issue 16 (May 3, 2012)
[191] *Id.*

complete lockdown was avoided.[192] These incidents serve as an example of how contemporary maritime security issues frequently entail intricate relationships between state sovereignty, international law, and power projection, going far beyond the realm of conventional piracy.

Terrorism at sea has also presented challenges for international maritime law. The IMO helped the Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation (SUA Convention)[193] be adopted in 1988 in response to the 1985 *Achille Lauro* hijacking[194]. This pact, along with its 2005 Protocol[195], makes politically motivated maritime violence such as ship seizure or passenger attacks illegal and requires that violators be prosecuted or extradited. Although invoked less frequently than piracy laws, SUA has proven useful, for example, in prosecuting those responsible for the 2004 bombing of *SuperFerry 14* in the Philippines.[196]

The IMO amended the SOLAS Convention to require improved security measures for ships and port authorities in the wake of the September 11 attacks, introducing the International Ship and Port Facility Security (ISPS) Code. The ISPS Code has established itself as a global standard since it went into effect in 2004. Significant gaps still exist, though, such as the lack of a consensus definition of maritime terrorism and persistent jurisdictional issues, especially in disputed regions like the South China Sea, where conflicting claims to sovereignty and the creation of artificial islands have led to legal tensions that UNCLOS mechanisms have found difficult to resolve.

It is obvious that challenges to marine security in the twenty-first century vary widely and are constantly changing, from state-sponsored aggression and maritime terrorism to high-seas piracy. The Somali experience showed that international cooperation and adaptive legal thinking can successfully counter even severe crises. Still, as new hotspots emerge and non-traditional risks grow, maritime law must continue to evolve. Future progress will require not only flexible legal interpretations but also the political

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[192] *What to Know About the British-Flagged Oil Tanker Seized by Iran Amid Escalating Tensions*, TIME (July 22, 2019), https://time.com/5631460/stena-impero-britain-iran/ (last visited May 21, 2025).
[193] *Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation*, Mar. 10, 1988, 1678 U.N.T.S. 221.
[194] Richard Pallardy, *Achille Lauro Hijacking*, *Encyclopædia Britannica* (Sept. 30, 2023), https://www.britannica.com/event/Achille-Lauro-hijacking (last visited May 21, 2025).
[195] *Protocol of 2005 to the Convention for the Suppression of Unlawful Acts Against the Safety of Maritime Navigation*, Oct. 14, 2005, IMO Doc. LEG/CONF.15/21.
[196] *Superferry14: The World's Deadliest Terrorist Attack at Sea*, Safety4Sea (Feb. 27, 2019)

will to uphold core principles like the freedom of navigation, even amid rising geopolitical turbulence. Navigating this balance between security and openness remains a central tension in the legal governance of the seas.

4.3 Jurisdictional Fragmentation and Legal Conflicts

The division of jurisdiction among several regulatory frameworks is a problem in today's maritime legal environment that receives less attention but has significant implications. Real-world implementation frequently shows conflicting powers and legal ambiguities that undercut the purpose of the law of the sea, which is to act as a cohesive constitution for the oceans, especially through the UNCLOS. A complex and even contradictory web of jurisdictions, including those of flag states, coastal states, port states, and international organizations, regulate the ocean rather than a single, centralized authority. Complex situations are frequently produced when these jurisdictions converge in a single maritime area, especially when incidents transcend legal or geographical borders.

The flag State system, which places a ship largely under the jurisdiction of the State whose flag it sails, is at the heart of this fragmentation.[197] This structure, in theory, gives the flag state responsibility for making sure the ship conforms with international standards related to labour rights, environmental protection, safety, and other areas. But in reality, the emergence of flags of convenience (FOCs) has revealed serious regulatory weaknesses. Open registries run by nations like the Marshall Islands, Panama, and Liberia enable foreign shipowners to register boats with no scrutiny or bureaucratic hassle.[198] These registers allow shipowners to circumvent the high safety and labour norms enforced by more stringent jurisdictions, but they are also frequently preferred for business purposes, inexpensive fees, tax benefits, and loosened laws.[199]

The outcome is often a legal vacuum. Vessels operating under FOCs may be owned by anonymous shell companies based in yet another country, managed by third-party

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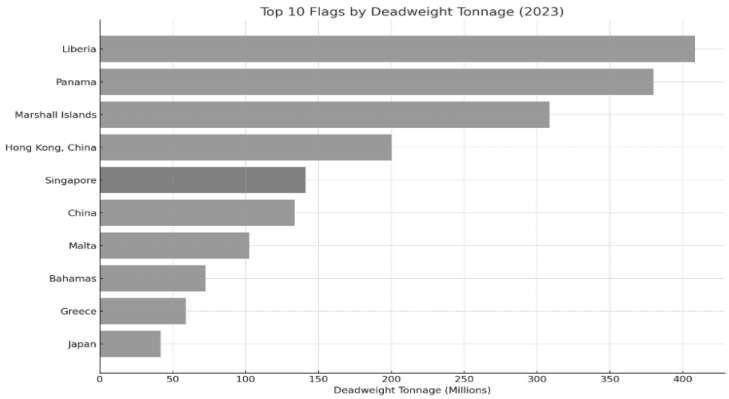
[197] UNCLOS art. 92.
[198] *Flags of Convenience in Global Maritime Trade: Legal, Safety, and Labour Implications of Open Registries*, MyJoyOnline (Apr. 16, 2025), https://www.myjoyonline.com/flags-of-convenience-in-global-maritime-trade-legal-safety-and-labour-implications-of-open-registries/ (last visited May 20, 2025).
[199] *Flags of Convenience*, Int'l Transp. Workers' Fed'n, https://www.itfglobal.org/en/sector/seafarers/flags-of-convenience (last visited May 19, 2025).

operators elsewhere, and crewed by seafarers of yet another nationality. This jurisdictional disconnect complicates legal responsibility in cases of maritime disasters. The 2002 *Prestige* oil spill off the coast of Spain is a prime example. Flagged under the Bahamas, owned by a Liberian shell organization, operated by a Greek company, and insured in the United Kingdom, the old tanker fell apart and caused a catastrophic environmental disaster.[200] The fractured ownership and registration structure severely hindered legal accountability and delayed compensation efforts.

Many FOCs just issue registration papers, despite UNCLOS Article 94's needs that flag states maintain effective control over their registered boats. Coastal and port states have therefore intervened to close the regulatory gap. For instance, the US has aggressively prosecuted foreign-flagged ships that violate MARPOL regulations when they arrive in US ports by using domestic laws like the Act to Prevent Pollution from Ships (APPS).[201] The United States has thus served as a worldwide enforcer, enforcing environmental protection policies in places where flag States have fallen short.[202]

Top 10 Flags by Deadweight Tonnage (2023)[203]

Figure 4



Source**:** UNCTAD (2023), Clarkson Research (2023)

[200] *The Prestige Disaster – A Tale of Oil Profiteering and State Complicity*, Union Communiste (Jan. 2003), https://www.union-communiste.org/en/2003-01/the-prestige-disaster-a-tale-of-oil-profiteering-and-state-complicity-1171 (last visited May 20, 2025).
[201] *See Cases Under the Act to Prevent Pollution from Ships (APPS)*, Kohn, Kohn & Colapinto LLP, https://kkc.com/laws-statutes-and-regulations-2/cases-under-the-act-to-prevent-pollution-from-ships-apps/ (last visited May 21, 2025).
[202] Act to Prevent Pollution from Ships, 33 U.S.C. §§ 1901–1915 (2018).
[203] Dr. David King Boison, *Flags of Convenience in Global Maritime Trade: Legal, Safety, and Labour Implications of Open Registries*, MyJoyOnline (Apr. 16, 2025), https://www.myjoyonline.com/flags-of-convenience-in-global-maritime-trade-legal-safety-and-labour-implications-of-open-registries/ (last visited May 22, 2025).

As of 2023, Panama, Liberia, and the Marshall Islands together represent more than 45% of the world's merchant fleet by deadweight tonnage, according to data from UNCTAD.[204] The world's merchant fleet is dominated by open registries like the Marshall Islands, Panama, and Liberia. These FOCs exemplify jurisdictional misalignment, where the country responsible for legal oversight of a vessel is often disconnected from the ship's beneficial owner or operational base. The result is a weakened capacity for uniform legal enforcement.[205]

The *MT Heroic Idun* Incident (2022–2023)

During a cargo operation at Nigeria's Akpo terminal, the Norwegian company's oil tanker, the *Heroic Idun*, flying the Marshall Islands flag, was arrested by Nigerian officials in August 2022 for allegedly not properly identifying itself.[206] The crew of the ship sent a distress call and left the area after mistaking an unidentified Nigerian naval patrol for a piracy threat. Nigeria later claimed that this was an attempt to fabricate a piracy incident and illegally enter their waters.[207]

Equatorial Guinea helped Nigerian authorities take the ship, and 26 members of the multinational crew were detained for almost nine months.[208] The case brought to light the complexity of jurisdiction at sea. Equatorial Guinea seized the ship in territorial waters, Nigeria, a coastline state, asserted enforcement powers within its EEZ, and the Marshall Islands, the flag state, contested the arrest's legitimacy and sought diplomatic redress.[209]

UNCLOS's legal system was not prepared to handle the situation quickly. Critics questioned whether the vessel had actually engaged in piracy or breached Nigerian

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[204] *Id.*
[205] *Id.*
[206] *Factsheet: MT Heroic Idun*, Nigerian Navy, De Maribus (Nov. 9, 2022), https://demaribus.net/wp-content/uploads/2022/11/factsheet-mt-heroic-idun-nov-9-nigeria-navy.pdf (last visited May 23, 2025).
[207] *The M/T "Heroic Idun" Case (Marshall Islands v. Equatorial Guinea), Prompt Release*, Int'l Trib. for the L. of the Sea, https://www.itlos.org/en/main/cases/list-of-cases/the-m/t-heroic-idun-case-marshall-islands-v-equatorial-guinea-prompt-release/ (last visited May 23, 2025).
[208] *Crew of Heroic Idun Returns Home After Nine Months Detention in Africa*, Safety4Sea (June 13, 2023), https://safety4sea.com/crew-of-heroic-idun-returns-home-after-nine-months-detention-in-africa/ (last visited May 23, 2025).
[209] Paul Peachey, *VLCC Heroic Idun Finally Leaves Nigeria After Nine-Month Detention*, TradeWinds News (May 29, 2023), https://www.tradewindsnews.com/tankers/vlcc-heroic-idun-finally-leaves-nigeria-after-nine-month-detention/2-1-1457796 (last visited May 23, 2025).

jurisdiction under UNCLOS Articles 56 and 58[210], notwithstanding Nigeria's use of its domestic anti-piracy law. Only when the ship's operator made a plea deal in Nigeria, paid a multi-million dollar settlement, and issued a public apology did the standoff end.[211] The case demonstrates how jurisdictional overlap among port, flag, and coastal nations can impede the settlement of maritime disputes and allow for coercive state strategies.

Legal fragmentation is further exacerbated by the proliferation of specialized treaties and sectoral regimes that operate alongside UNCLOS but often lack integrated enforcement mechanisms. For instance, MARPOL regulates pollution, the International Seabed Authority (ISA) is responsible for deep seabed mining under UNCLOS Part XI, and Regional Fisheries Management Organizations (RFMOs)[212] oversee most aspects of fisheries. The 2023 High Seas Biodiversity Treaty (BBNJ Agreement), which aims to safeguard marine biodiversity outside of national jurisdiction, is a recent addition to this legal patchwork.[213] Prior to the BBNJ, attempts to safeguard high seas ecosystems were generally regarded as "extremely fragmented and insufficient," with varying regional mandates.[214] The BBNJ seeks to establish standardized environmental impact assessments and marine protected areas, but its success will depend on cooperation among disparate institutions and consistent implementation by States.

Labour law presents a similar picture. Often referred to as the "seafarers' bill of rights," the Maritime Labour Convention (MLC) of 2006 was created to standardize labour standards across jurisdictions and consolidate more than 60 previous documents. However, its enforcement still hinges on flag and port States, with wide variability in application.[215] In theory, the MLC represents a triumph of legal unification, but in practice, uneven implementation undermines its reach.

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[210] UNCLOS arts. 56,58.
[211] Emmanuel Addeh, *Alleged Oil Theft: Owners of 3m Barrels-Capacity MT Heroic Idun Apologise to Nigeria*, ThisDay Live (May 15, 2023), https://www.thisdaylive.com/2023/05/15/alleged-oil-theft-owners-of-3m-barrels-capacity-mt-heroic-idun-apologise-to-nigeria/ (last visited May 23, 2025).
[212] NOAA Fisheries, *International and Regional Fisheries Management Organizations*, https://www.fisheries.noaa.gov/international-affairs/international-and-regional-fisheries-management-organizations (last visited May 21, 2025).
[213] *Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction*, opened for signature Sept. 20, 2023, https://www.un.org/bbnjagreement/en.
[214] *Biodiversity Beyond National Jurisdiction (BBNJ)*, United Nations, https://www.un.org/bbnj/ (last visited May 19, 2025).
[215] *Maritime Labour Convention*, Feb. 23, 2006, 2955 U.N.T.S. 499.

Fragmentation also manifests in criminal and civil jurisdiction at sea, sometimes leading to diplomatic tensions.

The 2012 *Enrica Lexie* incident, in which Italian marines on board an Italian oil tanker shot and killed two Indian fishermen because they believed they were pirates, is a notable case.[216] Italy contended on sovereign immunity for its state agents performing official responsibilities aboard an Italian-flagged vessel, whereas India asserted criminal jurisdiction because the killings took place within its exclusive economic zone (EEZ).[217] The conflict escalated to an UNCLOS Annex VII arbitration tribunal, which in its 2020 decision upheld Italy's claim to jurisdiction while acknowledging India's entitlement to compensation for the loss of life.[218] The tribunal's ruling reflected a delicate balancing act: asserting immunity for state agents while validating India's rights as the coastal State. While the legal dispute was eventually resolved, it illustrated how overlapping jurisdictional claims, flag State, coastal State, and nationality-based jurisdiction can result in prolonged conflict and complex. The tribunal's decision demonstrated a careful balancing act between upholding India's rights as the coastal state and claiming immunity for governmental officials. Even though the case was ultimately settled, it served as an example of how complex international litigation and protracted conflict can arise from overlapping jurisdictional claims, flag state, coastline state, and nationality-based jurisdiction.

The disarray of dispute resolution procedures under international marine law is a more general problem. The International Court of Justice (ICJ), the International Tribunal for the Law of the Sea (ITLOS), and ad hoc arbitration panels are among the fora from which states may select to settle disputes. This flexibility increases the possibility of inconsistent legal interpretations even though it enables customized solutions. The South China Sea Arbitration (Philippines v. China) is one of the most well-known cases demonstrating this tension. China denied the tribunal's jurisdiction and declined to take part in the proceedings, even though it is a party to UNCLOS. China rejected the verdict outright in 2016 after the tribunal found in favour of the Philippines, specifically on

[216] *The "Enrica Lexie" Incident (Italy v. India)*, PCA Case No. 2015-28, Permanent Court of Arbitration, https://pca-cpa.org/en/cases/117/ (last visited May 25, 2025).
[217] *Id.*
[218] *Id.*

maritime entitlements and environmental infractions.[219] The limitations of legal decision-making in the face of political authority were highlighted in this episode. The integrity of the international legal system is gravely threatened when strong states choose to violate the law.

The interaction of maritime law with other legal systems worsens these difficulties even more. For instance, the law of naval warfare, which is regulated by documents like the San Remo Manual and the Geneva Conventions, may take precedence over maritime law during times of armed conflict, especially when it comes to blockades, contraband, and how neutral shipping is treated.[220] Meanwhile, international trade law (especially WTO disciplines) and competition law also intersect with maritime activities, particularly in issues related to shipping subsidies and antitrust exemptions. On the private law front, concerns over forum shopping persist. Commercial maritime contracts may be litigated under English law in London or U.S. law in New York, depending on which forum offers a perceived advantage. This contributes to a patchwork system, where consistency in legal outcomes is elusive.

Attempts are being made to lessen fragmentation in spite of these difficulties. Memorandums of understanding (MOUs) governing port state management, such as the Paris and Tokyo MOUs, have raised inspection standards and decreased safe havens for inferior ships.[221] Furthermore, by examining governments' compliance with international maritime responsibilities, the IMO's Member State Audit Scheme fosters accountability. Increased information sharing and joint enforcement operations, especially in fisheries and environmental law, also help bridge jurisdictional divides.

However, there is still a structural conflict between sovereign zones and global commons. While coastal states maintain sovereignty over their territorial waters and exclusive economic zones, the high seas are officially declared to be open to everyone. Flag States, meanwhile, maintain their almost total authority over ships flying their flag. These overlapping claims will continue to spark jurisdictional disputes. The challenge

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[219] *South China Sea Arbitration* (Philippines v. China), PCA Case No. 2013-19, Award on Jurisdiction and Merits (July 12, 2016).
[220] *San Remo Manual on International Law Applicable to Armed Conflicts at Sea*, Int'l Inst. of Humanitarian L. (1994).
[221] *Paris Memorandum of Understanding on Port State Control*, https://www.parismou.org (last visited May 20, 2025); *Tokyo Memorandum of Understanding on Port State Control,* https://www.tokyo-mou.org (last visited May 20, 2025).

for maritime law scholars, regulators, and policymakers is to navigate these conflicts through dialogue, cooperation, and legal innovation rather than through coercive or unilateral action.

As we move into the next chapter, attention will shift to how legal reforms might reduce these jurisdictional frictions. Potential avenues include clarifying ambiguous UNCLOS provisions, empowering regional enforcement bodies, and enhancing the coherence of dispute settlement processes. For the time being, however, it is nevertheless clear that addressing jurisdictional fragmentation is necessary to guarantee that maritime law maintains its ability to successfully regulate the world's waters in a period of globalization, climate change, and shifting geopolitical alignments.

4.4 Automation, AI, and Digitization: The Technological Frontier

Advances in automation, artificial intelligence (AI), and digital systems are driving a significant technological revolution in the maritime sector. These advancements have the potential to completely transform maritime efficiency and operational capabilities, but they also bring with them a number of intricate legal and regulatory issues that the present legal system is only just starting to address.

Maritime Autonomous Surface Ships (MASS), which can function with little to no human crew, are arguably the most notable invention altering the industry. Prototypes are already sailing in the actual world, despite the fact that this first appeared futuristic. In 2023, the *MV Yara Birkeland*, a container ship that is entirely electric and self-sufficient, accomplished its first trip in Norway with success.[222] This milestone underscores a pivotal legal question: Can the existing international maritime legal framework adequately govern a fleet where ships are controlled by algorithms rather than people?

Crewed vessels were considered when writing the majority of the foundational maritime agreements. For instance, minimum personnel requirements and onboard safety standards are mandated by the Safety of Life at Sea (SOLAS) Convention. Similarly, ships must maintain a lookout utilizing sight and hearing in accordance with

[222] *Yara Birkeland, Two Years On*, Yara Int'l (2023), https://www.yara.com/knowledge-grows/yara-birkeland-two-years-on/ (last visited May 20, 2025).

the International Regulations for Preventing Collisions at Sea (COLREGs), which assume the presence of human operators by default. Human employees on board ships are likewise subject to the Standards of Training, Certification, and Watchkeeping (STCW) Convention. These presumptions are upset when autonomous ships are introduced into this legal environment. How can a ship fulfil responsibilities like keeping a watch or helping vessels in trouble if there is no actual crew on board?

Consider Rule 5 of the COLREGs, which mandates keeping a proper lookout via sight and hearing.[223] The provision may need reinterpretation in the era of MASS to accommodate AI-powered sensors and remote-control technologies. Furthermore, liability frameworks particularly for maritime collisions traditionally depend on identifying the fault of a "reasonably prudent mariner." But with AI systems making navigational decisions, fault attribution becomes blurred. Is liability to be placed on the shipowner, the software developer, the shoreside operator, or some combination thereof? Legal scholars have yet to settle these questions, and current treaties remain silent on how to allocate fault when machines make decisions that result in harm.

Gaps in definition make things much more difficult. A ship is typically assumed to have both a master and a crew under conventions like UNCLOS and those set up by the IMO. But with no one physically present on board, how can an autonomous ship fulfil duties like assisting persons in distress, an obligation under both SOLAS and UNCLOS Article 98? Some flag States have started to adapt domestic legislation, recognizing shore-based control centres as the official location of a ship's master. However, at the international level, consensus is still in development.

The IMO conducted a regulatory scoping exercise to determine if existing treaties are compatible with autonomous ships in order to meet this changing situation. This assessment revealed numerous legal gaps and ambiguities, prompting the IMO to begin drafting a new MASS Code. A non-binding version is expected by 2025, followed by a mandatory instrument by 2028[224]. This Code is anticipated to establish baseline safety and communication standards, protocols for remote operation centres, and measures for cybersecurity. Parallel efforts are being made to consider adjustments to the COLREGs

[223] *Convention on the International Regulations for Preventing Collisions at Sea*, Oct. 20, 1972, 1050 U.N.T.S. 16, Rule 5.
[224] *Autonomous Ships: Regulatory Scoping Exercise Completed*, IMO (May 25, 2021), https://www.imo.org/en/MediaCentre/PressBriefings/pages/MASSRSE2021.aspx (last visited May 20, 2025).

and other conventions to better align with AI-driven decision-making. Countries such as Norway, Singapore, and Finland have already designated test zones for autonomous vessels, offering real-world data to inform regulatory developments.[225]

Liability and insurance are another difficult area of law. Shipowners bear the majority of the responsibility under traditional maritime liability instruments, such as the International Convention on Civil Liability for Oil Pollution Damage (CLC), frequently on a strict liability basis.[226] In theory, autonomous ships might reduce incidents due to the elimination of human error. However, they also introduce new risk categories, including software malfunction, cybersecurity breaches, and communication system failures. If a navigational error by an AI system leads to a collision or pollution event, the shipowner may remain liable, but questions of recourse against system manufacturers or operators could lead to novel product liability claims. As such, maritime insurers are now exploring how to cover cyber risks and AI-related liabilities. Some scholars have even proposed strict liability regimes for autonomous operations, funded through mandatory insurance policies, mirroring the automotive sector's model for self-driving vehicles.

Cybersecurity has also become a central concern in the digital maritime ecosystem. The infamous NotPetya ransomware attack in 2017, which crippled A.P. Møller-Maersk, serves as a cautionary tale. The company's IT infrastructure was paralyzed for days, resulting in losses estimated between $250 million and $300 million.[227] The Port of Los Angeles was among the major ports that suffered collateral damage. Malicious actors could take control of an autonomous vessel, which could have fatal results and turn a ship into a weapon. Because of this, a completely new kind of maritime threat has emerged: cyber-piracy, in which hijacking occurs via hacking rather than physical force.

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[225] See *Norway Opens New Test Area for Autonomous Ships*, Offshore Energy (Dec. 7, 2017), https://www.offshore-energy.biz/norway-opens-new-test-area-for-autonomous-ships/.
[226] *International Convention on Civil Liability for Oil Pollution Damage*, Nov. 29, 1969, 973 U.N.T.S. 3.
[227] Andy Greenberg, *The Untold Story of NotPetya, the Most Devastating Cyberattack in History*, WIRED (Aug. 22, 2018), https://www.wired.com/story/notpetya-cyberattack-ukraine-russia-code-crashed-the-world/ (last visited May 20, 2025).

The IMO released Guidelines on Maritime Cyber Risk Management in response to this concern, which were subsequently codified in Resolution MSC.428(98).[228] According to the International Safety Management (ISM) Code, this resolution, which takes effect on January 1, 2021, mandates that cybersecurity be incorporated into a ship's Safety Management System (SMS). Furthermore, classification societies have begun issuing cyber-security notations for newbuild vessels, setting industry standards for resilience against digital threats. However, regulatory agility is essential as cyber threats evolve quickly, and the law must adapt in kind. Compounding the issue is the vast amount of data ships now generate and transmit, ranging from cargo manifests and routing information to crew identities. These developments intersect with data protection law, raising further questions about confidentiality, commercial sensitivity, and jurisdictional control over digital maritime records.

Beyond the realm of autonomous navigation, digitization is transforming almost every facet of maritime logistics. Traditional paper-based shipping documents are increasingly being replaced by electronic records, with electronic bills of lading (e-BLs) leading the charge. E-BLs offer advantages in speed and security for cargo tracking and trade finance.[229] However, legal systems have been slow to uniformly recognize digital equivalents as negotiable instruments. Although there has been progress, especially with the UNCITRAL Model Law on Electronic Transferable Records (2017), there is still an uneven level of legal acceptance.[230]

Additionally, port and customs authorities around the world are moving toward fully digital clearance systems. An amendment to the IMO's Convention on Facilitation of International Maritime Traffic (FAL Convention) requires that shipping data be sent electronically. Some initiatives are even exploring the use of blockchain platforms to secure and authenticate these documents. Nonetheless, courts still have to decide issues

[228] Maritime Cyber Risk Management in Safety Management Systems, IMO Res. MSC.428(98) (June 16, 2017).
[229] Francisco Petronilho, Hugo Fonseca & André Zúquete, *The State of the Art of the Electronic Bill of Lading*, 11 F1000Research 991 (2022), https://doi.org/10.12688/f1000research.123856.1.
[230] UNCITRAL Model Law on Electronic Transferable Records, U.N. GAOR, 71st Sess., Supp. No. 17, U.N. Doc. A/71/17 (2017).

pertaining to the enforceability of smart contracts employed in marine logistics and the evidential value of electronic data.[231]

AI is also being integrated into shipboard and shoreside operations. Onboard, AI systems are being deployed for voyage optimization, fuel efficiency, and predictive maintenance. At ports, algorithms are helping to manage berths, allocate cranes, and streamline cargo handling.[232] While these innovations improve efficiency, they also raise new legal liability questions. If an AI allocation system misroutes cargo, who bears responsibility, the software vendor, the port authority, or the shipping company? Legal causality and accountability are further complicated by the black box character of some AI algorithms, which have decision-making processes that are unknown even to their developers.

At the same time, digital technologies can strengthen legal enforcement. Satellite surveillance, AIS data, and AI-enhanced remote sensing are being used to detect violations such as illegal oil discharges, unlicensed fishing, and MARPOL breaches. For example, satellites can now track slicks in real time, helping identify the source of pollution. However, integrating this data into legal proceedings poses evidentiary challenges. It must be ensured that digital evidence is admissible, verifiable, and collected under proper legal standards. Moreover, cross-border enforcement still requires robust interstate cooperation, especially when violations occur in international waters.

The *Yara Birkeland* Autonomous Ship Trials (2023)

The first electric and mostly self-sufficient container ship in history to finish a journey with little assistance from humans was the *Yara Birkeland* in 2023.[233] Under remote supervision, the ship successfully navigated and auto-docked between two ports while

[231] *Convention on Facilitation of International Maritime Traffic (FAL Convention)*, IMO, https://www.imo.org/en/About/Conventions/Pages/Convention-on-Facilitation-of-International-Maritime-Traffic-%28FAL%29.aspx (last visited May 20, 2025).
[232] Mragank Kumar Yadav, *Transforming the Shipping Industry: Integrating AI-Powered Virtual Port Operators for End-To-End Optimization*, 3 J. ADV. RES. ENG'G & TECH. 245 (2024).
[233] *Yara Birkeland, two years on*, Yara Int'l (Mar. 2023), https://www.yara.com/knowledge-grows/yara-birkeland-two-years-on/ (last visited May 25, 2025).

operating along the Norwegian coast. For safety and compliance reasons, a human crew remained on board despite this milestone due to regulatory uncertainties.

The existing maritime legal framework, including conventions like SOLAS[234] and COLREGs[235], assumes the presence of human personnel, mandating manual lookout duties and onboard emergency responses. These conventions struggle to define who is responsible when there is no captain or crew present as autonomous technology advances. For example, the shipowner, software developer, or remote operations centre may be held liable if an AI-controlled ship collides with another.

The IMO started creating a Maritime Autonomous Surface Ships (MASS) Code in order to address these problems.[236] By 2025, a non-binding version is anticipated, and by 2028, a mandatory regulatory framework. As a result, the Yara Birkeland trial serves as a test of how far regulations need to change to adapt to the upcoming wave of AI-driven shipping. It also demonstrates the advantages of proactive collaboration between regulators and scientists to preserve maritime safety and innovation.

In conclusion, automation, AI, and digital innovation are reshaping the contours of maritime law. These shifts present both opportunities and regulatory headaches. While technological change has historically driven legal reform in the maritime sector from the age of sail to steam, and later to nuclear propulsion, today's digital transformation is moving at a much faster pace. The IMO's efforts to create adaptable frameworks for MASS and cyber risk are promising, but much remains to be done. The early phase of autonomous shipping will likely involve hybrid models, where manned and unmanned vessels share the same waters. This transition phase will test existing safety, insurance, and compliance regimes.

Even at a time with AI captains and blockchain cargo manifests, maritime law must ultimately change to preserve fundamental values such as environmental preservation, life safety at sea, and equitable responsibility distribution. Achieving this will require

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[234] *International Convention for the Safety of Life at Sea*, Nov. 1, 1974, 1184 U.N.T.S. 278.
[235] *Convention on the International Regulations for Preventing Collisions at Sea*, Oct. 20, 1972, 1050 U.N.T.S. 16.
[236] *Autonomous shipping*, Int'l Mar. Org., https://www.imo.org/en/MediaCentre/HotTopics/Pages/Autonomous-shipping.aspx (last visited May 25, 2025).

close cooperation between international institutions, national regulators, and industry stakeholders. With thoughtful adaptation, the law can keep pace with innovation, ensuring that digital maritime commerce advances not only efficiently, but responsibly.

4.5 Conclusion

The maritime legal order is navigating one of its most dynamic and demanding periods in recent history. From the pressures of climate change and transnational piracy to the complexities introduced by fragmented jurisdictions and the rapid integration of autonomous technologies, today's oceans pose legal challenges that were scarcely imaginable when the core frameworks of maritime law were developed.

International maritime law, however, has shown itself to be incredibly flexible in spite of these obstacles. Fundamental tools like the IMO conventions and the UNCLOS have shown to be relevant for a long time. The legal foundation for international maritime governance is still provided by them. However, the limitations of depending on treaties created decades ago have been made clear by the speed of change, especially in the areas of digital technology, environmental conditions, and international business.

Earlier legislatures simply could not have imagined many of the difficulties that are currently facing the international community, such as regulating unmanned vessels, reducing carbon emissions, or combating cyber-attacks. However, the international legal solution, which prioritizes institutional development and multilateral cooperation, has showed promise. The recent High Seas Biodiversity Treaty, the Ballast Water Management Convention, and coordinated international responses to piracy are a few examples of how nations are willing to close new legal gaps. But every new legal tool has its own set of problems, especially when it comes to widespread compliance and regular enforcement.

A central lesson to be drawn from these developments is the necessity of international harmonization. Maritime challenges are inherently transboundary. Global maritime routes and marine biodiversity cannot be protected by a single country acting alone. For instance, flag States, port States, and coastal States have to work closely together in the international campaign to stop piracy off the coast of Somalia. Similarly, because

pollutants and invasive marine species transcend national borders, minimizing the environmental impact of shipping necessitates the continuous use of global standards.

At times, where multilateral consensus lags, regional powers or influential States have stepped in to shape maritime rules through unilateral or regional action. While such initiatives can address urgent problems, they underscore the risk of regulatory fragmentation and highlight the enduring value of global legal forums like the IMO and UNCLOS. These organizations are essential in guaranteeing that all states, irrespective of their size or strength, have a say in establishing the regulations governing marine behaviour.

Every contemporary maritime challenge also reflects deeper structural tensions. There is a constant balancing act between freedom and regulation, sovereignty and collective interest, and innovation and legal certainty. In addition to maintaining public safety, order, and environmental preservation, the legal structure of the sea must permit the greatest amount of freedom of commerce and navigation. For instance, in light of climate challenges, more stringent regulations may be necessary to replace traditional liberties for the benefit of society as a whole. Similarly, while technological innovation in shipping is welcome, it must be bounded by legal rules that ensure safety, responsibility, and accountability.

The path forward will likely require the modernization and supplementation of existing treaties through interpretative clarifications, new protocols, and flexible soft-law instruments. Regulatory innovations will also depend on robust participation by all stakeholders and a commitment to equitable and science-based governance. Effective enforcement whether through empowered port State measures, improved oversight of flag States, or coordinated international operations remains key to upholding the integrity of the rules already in place.

In conclusion, contemporary forces are reshaping the oceans' legal order rather than causing it to collapse. Maritime law has proven it can evolve, but the velocity and complexity of current global transformations require continued legal agility. The pressing issues identified in this chapter, whether environmental, technological, or jurisdictional are not insurmountable. But they will require proactive lawmaking, informed by both tradition and innovation.

CHAPTER 5: BRIDGING THE GAPS: LEGAL REFORM AND THE FUTURE OF MARITIME LAW

5.1 Introduction

Marine law stands at a critical juncture in the 21st century. For decades, global trade and legal consistency have relied on foundational instruments like UNCLOS and related maritime agreements to regulate activities at sea. Yet, in the face of accelerating technological change, evolving geopolitical tensions, and mounting environmental challenges, these longstanding legal frameworks are increasingly being questioned for their ability to meet today's complex demands.

The bounds of current marine regulations are being severely pushed by contemporary issues like climate change, the digitalization of shipping, and changing trade routes, necessitating an immediate review. The 2021 blockage of the Suez Canal by the *Ever Given* one of the world's largest container vessels brought global trade to a near standstill for several days, sharply highlighting the vulnerabilities in existing maritime infrastructure and logistical systems.[237] This single event highlighted how interconnected, and at times fragile, the global trade system has become and how a localized maritime disruption can have cascading legal and economic consequences across jurisdictions.[238]

Simultaneously, the ongoing melting of Arctic Sea ice is shifting from a distant concern to a present-day reality, creating access to previously impassable northern maritime routes. These emerging routes, while economically attractive, bring with them a host of environmental and jurisdictional complexities that existing legal frameworks are ill-prepared to handle. Parallel to these environmental transformations, global efforts toward sustainability have intensified. For instance, the IMO has recently implemented significant measures to curb greenhouse gas emissions from ships, signalling a shift

[237] Zhangchi Yang, *The Suez Canal Blockage in March 2021: The Causation of the Incident and Its Economic and Social Influences*, 3 ADVANCES IN ECON., MGMT. & POL. SCI. 245 (2024).
[238] Christoph von Burgsdorff, *Ever Given: an Example of How Complex International Liability for Damages Can Be*, INT'L B. ASS'N (Aug. 20, 2021), https://www.ibanet.org/ever-given-international-liability-damages (last visited May 21, 2025).

toward a more sustainable and environmentally responsible approach to maritime regulation.[239]

This chapter aims to offer forward-looking legal reforms while critically analysing the shortcomings of the existing maritime legal system. These reforms aim to enhance enforcement mechanisms, promote inclusivity across diverse stakeholders, and align maritime governance with global sustainability goals. Adopting a global perspective, the chapter acknowledges the shared dependency of both developed and developing nations on the high seas and their regulation.

Emerging concerns such as cybersecurity vulnerabilities in maritime operations, the pressing necessity for green shipping innovations, and the legal ramifications of expanded navigation through the Arctic are central to this analysis. By drawing on recent case studies including the *Ever Given* incident, Arctic maritime developments, and the IMO's 2023 Greenhouse Gas Strategy[240], this chapter underscores both the inadequacies of the status quo and the potential avenues for reform.

5.2 Outdated Norms and Gaps in the Maritime Legal Framework

While maritime law rests on strong and time-tested foundations, the contemporary framework shows clear signs of strain under modern pressures. One key challenge is that treaties such as UNCLOS, adopted in 1982, reflect the geopolitical and technological context of their era, and may not fully address the complex and evolving realities of the twenty-first century. As new challenges emerge and old issues become more urgent, persistent gaps and outdated provisions are increasingly evident. This section explores three critical areas where the current legal regime falls short: enforcement and jurisdiction, human rights and labour protections, and environmental and climate governance.

[239] *2023 IMO Strategy on Reduction of GHG Emissions from Ships*, Int'l Mar. Org. (July 7, 2023).
[240] International Maritime Organization, *2023 IMO Strategy on Reduction of GHG Emissions from Ships*, IMO Res. MEPC.377(80) (July 7, 2023)

5.2.1 Enforcement and Jurisdictional Challenges

One of the most enduring and challenging weaknesses in the international maritime legal system is the enforcement of laws on the high seas. At the heart of this framework lies the UNCLOS principle that ships are generally governed by the jurisdiction of their flag state, with only limited exceptions to this rule.[241] Although this system is intended to uphold state responsibility, in reality it frequently leads to enforcement gaps particularly when flag states do not exercise meaningful oversight. This problem is most pronounced with flags of convenience, where vessels register under countries that lack the capacity or willingness to enforce maritime laws.[242]

This loophole enables vessel owners to strategically register under states that offer lenient regulations, allowing them to sidestep more stringent safety, environmental, and labour standards. Consequently, a substantial segment of the world fleet operates with little oversight, undermining the consistent application of international maritime norms.

UNCLOS Article 91[243] calls for a genuine link between a vessel and its flag state, but in practice this requirement has largely remained symbolic. Due to the vague definition of what qualifies as a sufficient connection, international courts have typically refrained from enforcing it. To address this gap, the United Nations drafted the Convention on Conditions for Registration of Ships in 1986, aiming to strengthen the link between ships and their states of registration.[244] Unfortunately, not enough ratifications prevented the convention from ever coming into effect. Because of this, the issue still exists, and many shipowners keep searching for flags that suit their needs with little interference from the government.

In response to weak flag state enforcement, Port State Control (PSC) has emerged as an alternative mechanism. Under regional frameworks such as the Paris Memorandum of Understanding (MoU), port authorities are empowered to inspect foreign ships and detain those that fail to meet international safety, environmental, or labour standards.[245] The IMO has encouraged such initiatives, recognizing their value. However, these

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[241] UNCLOS art. 92.
[242] *UNCLOS: The Law of the Sea in the 21st Century*, HL Paper 159, at 24 (2022) (UK).
[243] UNLCLOS art. 91.
[244] *United Nations Convention on Conditions for Registration of Ships* art. 4, Feb. 7, 1986, U.N. Doc. A/CONF.131/19 (not in force).
[245] Int'l Mar. Org., *Port State Control*, https://www.imo.org/en/OurWork/MSAS/Pages/PortStateControl.aspx (last visited May 21, 2025).

regimes are regional in scope and dependent on the commitment of individual port states, limiting their effectiveness on a global scale.

Maritime security is directly impacted by this jurisdictional ambiguity. Where law enforcement is dispersed, crimes like illicit fishing, smuggling, and piracy thrive. UNCLOS grants limited authority to warships to interdict vessels engaged in piracy or stateless ships, but once a vessel is flagged, regardless of the flag's legitimacy, jurisdictional complexities arise.[246] Modern pirates and traffickers often exploit this system, using obscure flags or operating in areas where enforcement is weak.

To address these gaps, legal scholars and policymakers have proposed several solutions: bolstering universal jurisdiction for egregious crimes, creating regional enforcement coalitions, and tightening domestic laws on flag registration to reduce abuse. Without such reforms, the doctrine of exclusive flag-state jurisdiction will continue to impede effective maritime law enforcement.

The *Ever Given* incident in March 2021 vividly exposed systemic weaknesses in the global maritime system. When the 400-meter-long container ship ran aground in the Suez Canal, it brought one of the world's busiest shipping lanes to a halt for nearly a week, underscoring the fragility of key trade arteries and the ripple effects of logistical disruptions.[247] The blockage caused delays for over 400 ships, leading to significant economic fallout and triggering a web of complex legal disputes over liability, damages, and contractual obligations. The ownership and operational structure of the *Ever Given*, Japanese-owned, Panamanian-flagged, German-managed, and chartered by a Taiwanese company revealed how complicated modern shipping arrangements have become.[248]

The legal consequences extended across several jurisdictions: claims involving the Suez Canal Authority were subject to Egyptian law; international conventions governed issues of salvage and collision liability; and private maritime contracts activated the principle of general average, requiring cargo owners to proportionally contribute to the

[246] UNCLOS art. 105.
[247] *Ever Given: Ship that blocked Suez Canal sets sail after deal signed*, BBC News (July 7, 2021), https://www.bbc.com/news/world-middle-east-57746424 (last visited May 25, 2025).
[248] *Ever Given released from Suez canal after compensation agreed*, The Guardian (July 7, 2021), https://www.theguardian.com/world/2021/jul/07/ever-given-released-from-suez-canal-after-compensation-agreed (last visited May 23, 2025).

costs of the salvage operation.[249] Notably, York-Antwerp Rules, though not part of any international treaty, served as the governing norm through contractual adoption.[250] The dispute took months to resolve, highlighting how fragmented and outdated legal systems can delay accountability and resolution in global shipping crises. The Ever Given's grounding may have been an isolated event, but it exposed deeper structural deficiencies in maritime liability law that demand attention.

5.2.2 Human Rights and Labour Standards at Sea

The inadequate protection of people's labour conditions and human rights at sea is another serious flaw in the current marine legal system. Traditional maritime law has focused primarily on state rights and obligations, particularly in terms of navigation, resource jurisdiction, and dispute resolution. Issues concerning individuals such as seafarers, migrant workers, and fishermen have long been sidelined.

Despite being thorough in many ways, UNCLOS only covers a small portion of individual rights outside of the general duties to help those in need.[251] Given the many humanitarian crises that are still occurring at sea, this carelessness has been problematic. For instance, there have been repeated instances of abandoned crews, where vessel owners in financial distress leave workers stranded and unpaid.[252] In the fishing sector, forced labour and exploitation are increasingly documented, particularly aboard ships operating under flags of convenience.[253]

The plight of maritime migrants and asylum seekers compounds the problem. When vessels carrying migrants are denied entry to ports or left in limbo at sea, the lack of clear legal obligations regarding disembarkation, rescue, and asylum processes creates a humanitarian vacuum.[254]

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[249] Lauri Railas, *The Casualty of M/S Ever Given – Some Legal Consequences*, INTERTRAN BLOG (May 10, 2021), https://blogs.helsinki.fi/intertran-blog/2021/05/10/the-casualty-of-m-s-ever-given-some-legal-consequences-prof-lauri-railas/ (last visited May 25, 2025).
[250] *York-Antwerp Rules of General Average* (YAR 2016), adopted by the Comité Maritime Int'l.
[251] UNCLOS art. 98.
[252] *Abandonment List*, Int'l Transp. Workers' Fed'n, https://www.itfseafarers.org/en/directories/abandonment-list (last visited May 21, 2025).
[253] *Hidden Chains: Rights Abuses and Forced Labour in Thailand's Fishing Industry*, Human Rights Watch (Jan. 23, 2018), https://www.hrw.org/report/2018/01/23/hidden-chains/rights-abuses-and-forced-labour-thailands-fishing-industry (last visited May 21, 2025).
[254] *Desperate Journeys: Refugees and Migrants Arriving in Europe and at Europe's Borders - January to December 2018*, UNHCR (Jan. 2019).

These vulnerabilities were significantly worsened by the COVID-19 pandemic. Hundreds of thousands of sailors were left stranded at sea in 2020 and 2021 due to travel restrictions; many of them were working well past their contract terms and had no access to repatriation, shore leave, or medical treatment. The episode highlighted how ill-equipped current legal frameworks are to protect essential maritime workers in times of global crisis.

Certain international agreements have been developed to tackle these issues. Notably, the Maritime Labour Convention (MLC), 2006 adopted under the auspices of the International Labour Organization (ILO) establishes comprehensive rights and protections for seafarers, covering standards related to accommodation, wages, working conditions, and hours of rest. Though widely ratified, enforcement remains inconsistent, and several major flag states have yet to fully implement its provisions. The Work in Fishing Convention, 2007, which seeks to safeguard conditions for fisheries workers, has similarly suffered from low ratification rates.[255]

The concept of "human rights at sea" has gained traction among advocates aiming to extend universal human rights protections such as those enshrined in the International Covenant on Civil and Political Rights to all individuals, irrespective of their location on the world's oceans.[256] In 2022, the movement received renewed momentum with the launch of the Geneva Declaration on Human Rights at Sea, a civil society initiative affirming that all individuals at sea are entitled to safety, dignity, and legal protection, regardless of their status or nationality.[257] While non-binding, the declaration serves as a rallying point for future legal reform.

Yet, enforcement remains the core challenge. In many cases, human rights violations occur aboard ships flying flags of convenience, with little to no oversight or legal recourse. Unless legal reform addresses these jurisdictional and enforcement issues, the high seas will remain, in effect, a legal grey zone for human rights. As the UK House of Lords observed in a 2022 report, the evolving importance of human rights at sea now

[255] *Work in Fishing Convention (No. 188)*, Nov. 14, 2007, Int'l Lab. Org.
[256] *International Covenant on Civil and Political Rights*, Dec. 16, 1966, 999 U.N.T.S. 171.
[257] *Geneva Declaration on Human Rights at Sea*, Human Rights at Sea (Mar. 1, 2022).

warrants serious attention in treaty law and potentially, new international instruments.[258]

5.2.3 Environmental and Climate Oversights

Environmental regulation within maritime law has come a long way, but gaps and outdated mechanisms continue to limit its effectiveness, especially in light of the climate crisis. When UNCLOS entered into force in 1994, climate change had not yet emerged as the defining global challenge it is today. As a result, contemporary issues such as carbon emissions from shipping, biodiversity loss, and ocean acidification are insufficiently addressed in the treaty framework.

Nearly 3% of greenhouse gas emissions worldwide are currently attributable to shipping, which is equivalent to emissions from large developed nations.[259] However, the Kyoto Protocol and the Paris Agreement did not include these emissions, thus the IMO is in charge of regulating them.[25] Although there have been some advancements, such as the 2018 Initial GHG Strategy and the adoption of Energy Efficiency Design Index (EEDI) benchmarks, these have mostly lacked legally obligatory enforcement mechanisms.

The IMO adopted a Revised GHG Strategy in July 2023, aiming for net-zero emissions by or around 2050 and recommending a decrease of 20–30% by 2030 and 70–80% by 2040.[260] Additionally, the policy stipulates that by 2030, at least 5% of the energy utilized in international shipping must originate from fuels with zero or almost zero emissions. While this marks a substantial leap forward, the strategy functions more as a roadmap than enforceable law. Implementation will hinge on the development of specific regulations, such as carbon levies or emission trading systems, which remain under negotiation.

Enforcement of existing environmental rules is already patchy. The MARPOL Convention has led to meaningful reductions in marine pollution through various

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[258] House of Lords International Relations and Defence Committee, UNCLOS: The Law of the Sea in the 21st Century, HL Paper 159, Session 2021–22 (Mar. 1, 2022)
[259] Climate finance needs shipping industry to launch first global tax, *Climate Change News* (Mar. 24, 2025), https://www.climatechangenews.com/2025/03/24/its-time-for-shipping-to-launch-first-global-tax-on-a-polluting-sector/ (last visited May 23, 2025).
[260] *2023 IMO Strategy on Reduction of GHG Emissions from Ships*, Int'l Mar. Org. (July 7, 2023), https://www.imo.org/en/OurWork/Environment/Pages/2023-IMO-Strategy-on-Reduction-of-GHG-Emissions-from-Ships.aspx (last visited May 21, 2025).

annexes, including the notable 2020 global cap on sulfur content in marine fuel.[261] Yet enforcement depends heavily on the capabilities and commitment of flag and port states, many of which lack the resources to monitor compliance effectively.

Moreover, certain emerging environmental threats like black carbon emissions, underwater noise, and pollution from new green fuels (such as ammonia and hydrogen) are not comprehensively addressed in current treaties.[262] As shipping transitions to cleaner technologies, new risks will arise that demand prompt legal responses to ensure both safety and sustainability.

In addition to pollution, biodiversity conservation is another significant shortcoming in marine governance. UNCLOS does not offer a specific framework for managing biodiversity outside of national jurisdiction (BBNJ), although outlining basic commitments to safeguard marine habitats. The High Seas Biodiversity Treaty, or BBNJ Agreement, was adopted in 2023 to close that gap. This treaty requires environmental impact studies for operations in the high seas and permits the establishment of marine protected areas. It serves as an example of how supplemental agreements can update preexisting legal frameworks.

Climate change also raises unprecedented legal questions, particularly around sea-level rise. As coastlines shift and low-lying island states face potential submersion, the legal validity of maritime boundaries drawn from current baselines is increasingly contested.[263] Some have called for the "freezing" of baselines, to preserve states' EEZs even if their land area shrinks.[264] While this idea is gaining traction, no formal international consensus exists yet.

In extreme scenarios, entire states could become uninhabitable, triggering difficult questions about sovereignty, statehood, and maritime entitlements. These developments demand urgent legal innovation, as current frameworks offer no answers to such existential threats.

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[261] *Annex VI to the MARPOL Convention*, as amended, Int'l Mar. Org., IMO Res. MEPC.176(58) (entered into force Jan. 1, 2020).
[262] Zongbo Shi et al., *Perspectives on Shipping Emissions and Their Impacts on the Surface Ocean and Lower Atmosphere: An Environmental-Social-Economic Dimension*, 11 Elementa: Sci. Anthropocene 00052 (2023).
[263] *Sea-Level Rise in Relation to International Law*, Int'l Law Comm'n, U.N. Doc. A/CN.4/740 (2021).
[264] *Id.*

In conclusion, while maritime law has taken strides in addressing environmental concerns through instruments like MARPOL, the London Dumping Convention, and various regional accords, it remains insufficiently responsive to the speed and scale of today's environmental challenges. To safeguard ocean health and align with global climate goals, the legal regime must undergo systematic reform and continuous evolution.

5.3 Pathways for Legal Reform: Towards Enforcement, Inclusivity, and Sustainability

The evolving dynamics of maritime activity, driven by climate change, technological innovation, and shifting geopolitical alliances, make it imperative for maritime law to adapt. Addressing current deficiencies requires not a wholesale replacement of foundational instruments like the UNCLOS, but a methodical strengthening of its framework through updated protocols, supplementary agreements, and modern interpretative practices.[265] As emphasized by the UK House of Lords in its review of UNCLOS, the treaty must function as a "living instrument", responsive to the demands of contemporary maritime governance.[266] With that ethos in mind, this chapter identifies key reform pathways across three interdependent fronts: enforcement and compliance, inclusivity, and environmental sustainability.

5.3.1 Strengthening Enforcement and Compliance

Effective enforcement lies at the heart of any credible legal system. In the maritime domain, however, jurisdictional complexity and the decentralized nature of authority often dilute enforcement mechanisms. Since there is no overarching global authority to police the seas, responsibility for compliance falls largely on individual flag states, which are often inconsistent in their oversight.

Re-examining the genuine link requirement for ship registration is a crucial first step toward reform. Under the existing system, flags of convenience are widely used, allowing vessel owners to register under jurisdictions with less regulation.[267] Abuse

[265] UNCLOS art. 311.
[266] *See UNCLOS: The Law of the Sea in the 21st Century*, House of Lords Int'l Relations & Def. Comm., HL Paper 159, at 3 (2021)
[267] Serhii Kuznietsov, The *"Genuine Link" Concept: Is It Possible to Enhance the Strength?*, 7 Lex Portus 65, 72–73 (2021)

could be reduced by reviving debates over the UN Convention on Conditions for Registration of Ships[268] or creating a modern agreement that establishes fundamental requirements for registries, such as observable operational or economic ties. Even absent a new treaty, coalitions of port and coastal states could commit to recognizing only those registries that meet minimum transparency and safety benchmarks. This coalition of compliance could exert soft pressure on lagging states by threatening their vessels with classification as de facto stateless, subject to interdiction or refusal of port entry.

Strengthening Port State Control is an additional crucial component. Port states are now able to examine and detain non-compliant vessels thanks to regional agreements like the Paris MoU. However, expanding PSC's reach through a binding IMO instrument could standardize inspection mandates across jurisdictions, ensuring broader accountability regardless of a vessel's flag. Such a measure would be especially beneficial to developing states, whose enforcement capabilities may be hindered by limited resources. Technical cooperation and global inspection data sharing perhaps through a maritime counterpart to Interpol would amplify enforcement without undermining sovereign interests.[269]

In sectors like maritime security, more nuanced legal reforms are warranted. UNCLOS does permit interdiction of pirate ships, but practical enforcement is often stalled by procedural and evidentiary gaps. Important loopholes would be filled by harmonizing national anti-piracy laws and extending authority over illegal, unreported, and unregulated (IUU) fishing immediately outside EEZs.[270] History has demonstrated the success of multinational operations such as those targeting Somali piracy where cooperative legal authority was clearly defined.

Private actors, particularly marine insurers and financiers, also have a role in strengthening compliance. By conditioning coverage and financing on adherence to international standards, private industry can incentivize responsible behaviour.[271] A

[268] *United Nations Convention on Conditions for Registration of Ships*, Feb. 7, 1986, U.N. Doc. TD/RS/CONF/19/Add.1.
[269] UNCLOS arts. 105–111.
[270] Callum Musto & Efthymios Papastavridis, *Tackling Illegal, Unreported, and Unregulated Fishing Through Port State Measures*, 22 Melb. J. Int'l L. (2021)
[271] Ehsan Jahanian, *Impact of Marine Insurers on Maritime Safety Laws and Rescue Operations at Sea*, 8 Int'l J. L. 99, 100–01 (2022)

further innovation could be the establishment of an international maritime compliance tribunal with reporting, not punitive authority. Much like UN human rights bodies, such a tribunal could regularly assess and publish country-level compliance reviews, bringing transparency and soft pressure to bear on delinquent states.

5.3.2 Enhancing Inclusivity in Maritime Governance

Inclusion, both of actors and of principles, must be a cornerstone of any reform-minded maritime legal system. Governance has historically centred on powerful flag states and commercial interests. Moving forward, more room must be made for developing states, civil society, and non-state actors, particularly as maritime challenges increasingly intersect with global equity and justice.

One avenue is institutional. While nearly all seafaring nations are members of the IMO, not all have an equal voice. Least Developed Countries (LDCs) and Small Island Developing States (SIDS) frequently struggle to participate effectively in decision-making due to financial limitations and technical deficiencies. Programs for financial aid that promote involvement, capacity-building, and expert access might aid in reversing this imbalance. The 2023 IMO Greenhouse Gas Strategy negotiations showcased the potential of inclusive diplomacy, with Pacific Island nations pushing for and achieving language around a "just and equitable transition."[272]

Inclusivity must also extend to non-state actors. Environmental organizations, labour unions, and coastal communities offer valuable insights into safety, labour, and ecological concerns. Their inclusion, at minimum through consultative status, would enrich IMO deliberations and ensure maritime governance is informed by a broader spectrum of expertise and values.

A shift in legal values is also critical. Traditional maritime law has privileged economic efficiency and sovereign navigation rights over human rights and social justice. This imbalance must be corrected. Legal reforms must eventually be enshrined in legally enforceable documents, although they may begin with soft-law commitments like an official endorsement for the Geneva Declaration on Human Rights at Sea. Changes to UNCLOS, SOLAS, or MARPOL that specifically mandate that states address human

[272] Goran Dominioni, *The 2023 IMO Greenhouse Gas Strategy: Considerations of Equity*, Int'l J. Mar. & Coastal L. (2024)

rights abuses on ships they flag, or host could be one example of this.[273] Port states should be permitted, under international law, to intervene in cases involving forced labour, human trafficking, or abandonment.

The Maritime Labour Convention (MLC), 2006 remains a vital tool in this effort and should be further strengthened. The 2024 amendments that would address seafarer welfare and pandemic readiness are a positive start. Increasing ratification and enforcement procedures would guarantee more comprehensive protection for the entire world's fleet. A future treaty perhaps a Maritime Human Rights Protocol jointly backed by the IMO, ILO, and UNHCR could unify and standardize protections for seafarers, passengers, and maritime migrants.

Economic inclusivity is another overlooked but essential dimension. The International Seabed Authority (ISA), which oversees deep-sea mining, must uphold the idea of humanity's shared heritage to guarantee that resource advantages are distributed fairly and are not monopolized by a small number of highly developed nations..[274] Similarly, in fisheries governance, laws should be amended to recognize the roles of small-scale fishers and indigenous communities, granting them participatory rights in resource management and conservation policymaking.

Lastly, inclusivity requires an interdisciplinary legal outlook. Maritime law intersects increasingly with trade, environmental, and human rights law. Future reforms should mandate impact assessments that evaluate not just legal compliance but economic and equity effects especially on trade-dependent developing nations. The proposed fuel levy tied to revenue redistribution under the IMO's GHG Strategy is one such effort to build fairness into climate mitigation.[275] In this way, inclusivity becomes both a moral imperative and a functional necessity for durable legal reform.

5.3.3 Law for Sustainable and Green Shipping

Perhaps the most urgent legal transformation facing maritime law today lies in facilitating a shift toward environmental sustainability. With climate change now at the forefront of global priorities, the maritime sector must adopt laws that not only regulate

[273] Natalie Klein, *International Law-Making and the Geneva Declaration on Human Rights at Sea*, Leiden J. Int'l L. (2025)
[274] UNCLOS art. 136.
[275] Joel Ong, *Decarbonizing International Shipping at the IMO: Are Alternative Fuels the Way Forward?*, 17 Carbon & Climate L. Rev. 207, 208 (2023)

emissions but also embed long-term ecological thinking into shipping, port development, and marine spatial planning.

Central to this transformation is decarbonizing global shipping. The 2023 IMO Revised GHG Strategy to set ambitious targets, but these need legal teeth.[276] A combination of technical measures (like stricter fuel-efficiency standards) and economic instruments (such as carbon pricing) must be introduced through binding amendments to MARPOL or a dedicated protocol. One widely supported idea is a global carbon levy whose revenues would help subsidize low-carbon fuels and assist developing countries in climate adaptation. Legal mechanisms will also be needed to ensure transparency, for example, requiring ships to disclose carbon intensity ratings, which could influence market decisions by charterers and port authorities.[277]

Emerging technologies also call for proactive legal guidance. Ammonia, hydrogen, and bio-LNG are examples of alternative fuels that offer both opportunities and concerns, ranging from flammability to toxicity. Emergency procedures should be required for the use of innovative fuels, and SOLAS and the International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels (IGF Code) should be modified appropriately.[278] Creating incentives for early adopters like green certifications, priority port access, or lower fees could reinforce voluntary compliance while standards evolve.

Pollution control remains a backbone of marine environmental law. Despite being a significant milestone, the 2024 ban on heavy fuel oil (HFO) in the Arctic contains exceptions that can postpone full implementation.[279] Loopholes must be closed and similar bans extended to other vulnerable regions. Additional areas for legal development include regulation of underwater noise (which disturbs marine life), stricter rules on plastic waste discharge, and mandatory spill response capabilities for emerging trade routes.

As Arctic Sea lanes become more navigable, regulation must keep pace. The Polar Code, effective since 2017, sets minimum safety and environmental standards, but its

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[276] *Id.*
[277] *Methodology*, Clean Shipping Index (2024), https://cleanshippingindex.com/projekt/clean-shipping-index/methodology.html (last visited May 21, 2025).
[278] *International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels (IGF Code)*, Int'l Mar. Org. (2015).
[279] *Future Arctic Regulatory Interventions: Discussing the Impact of Banning the Use of Heavy Fuel Oil*, 46 Polar Geography 123 (2023).

limited application to large vessels leaves gaps.[280] A more comprehensive framework could extend rules to smaller crafts, require mandatory ice navigation preparedness, and impose special liability regimes for accidents in extreme conditions.

Finally, the shift toward a blue economy balancing ocean-based development with conservation should be embedded in law. This includes strategic environmental assessments before port construction, strengthened rules on shipbreaking (as seen in the Hong Kong Convention), and global standards for green ports that minimize carbon emissions.[281] Legal regimes should also promote climate adaptation, requiring coastal infrastructure to meet rising sea-level resilience criteria.

In essence, greening maritime law requires both foresight and enforceability. As climate science advances and public pressure mounts, legal reform must ensure that sustainability is not merely aspirational, but a legal obligation backed by economic incentives and regulatory rigor. If implemented effectively, the coming decades could witness maritime law's most profound transformation, one that aligns trade with planetary boundaries and protects the shared heritage of the seas.

5.4 Emerging and Future Challenges on the Horizon

The maritime world is facing not only present-day reforms but also a wave of unprecedented future challenges that will redefine global trade and maritime operations. These issues ranging from cybersecurity vulnerabilities and autonomous shipping technology to the legal complexities of Arctic navigation and climate-induced transformations demand timely, adaptive legal responses. This section outlines the most pressing of these emerging concerns and discusses how international maritime law might evolve to address them.

5.4.1 Cybersecurity Threats to Shipping

The growing digitisation of global shipping seen in navigation systems, cargo tracking, port logistics, and shipboard operations has significantly increased the sector's vulnerability to cyber threats. These threats are no longer hypothetical; they have

[280] *Polar Code Implementation Review*, Int'l Mar. Org. (2023).
[281] *Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships*, May 15, 2009.

already materialised in ways that disrupt trade and compromise safety. One such example is the NotPetya malware attack in 2017, which completely disrupted Maersk's global IT systems, bringing supply chains and container terminals to a near complete stop and resulting in losses of up to $300 million.[282]

Such incidents demonstrate that cyberattacks are becoming a serious risk to maritime infrastructure, whether driven by criminal, political, or state-backed motives. Yet, the legal architecture governing these risks is still rudimentary. For instance, the existing conventions such as the SOLAS focus on physical safety but lack specific obligations relating to cybersecurity.

The IMO established Resolution MSC.428(98) to address these deficiencies, mandating that shipping operators integrate cyber risk into their safety management systems by 2021.[283] But, this initiative largely takes the form of soft law and lacks enforceability. Scholars have rightly noted that the IMO's current measures are reactive and fragmented, insufficient for the scale of modern cyber threats.[284]

Going forward, a more structured legal framework is needed. This could include developing mandatory cybersecurity standards under SOLAS, similar to MARPOL's treatment of environmental risks, and expanding international cooperation to share cyber incident data. National measures such as mandatory reporting of maritime cyber incidents and cyber-readiness audits are also gaining traction and could serve as models for international harmonisation.

Another layer of complexity involves liability. If a vessel is compromised due to inadequate cyber defences, leading to a collision or pollution, can the shipowner be held responsible for failing to implement basic cyber protections? Insurance companies have started to consider these issues, especially Protection and Indemnity (P&I) Clubs, which frequently categorize cyberattacks as a result of force majeure or exclude them from coverage under war risk conditions. Legal clarity is essential, especially in

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[282] Cyberattack Cost Maersk as Much as $300 Million and Disrupted Operations for 2 Weeks, *L.A. Times* (Aug. 17, 2017), https://www.latimes.com/business/la-fi-maersk-cyberattack-20170817-story.html (last visited May 25, 2025).
[283] Resolution MSC.428(98), *Maritime Cyber Risk Management in Safety Management Systems*, Int'l Mar. Org. (June 16, 2017)
[284] *See* An insight on the role and response of the International Maritime Organization and classification societies in response to the evolving dynamics of maritime cybersecurity, 2025 J. Mar. Pol'y & L. 132, 135–36, https://journals.sagepub.com/doi/pdf/10.1177/08438714251325206 (last visited May 21, 2025).

contract law charterparty clauses, for instance, may need to specify responsibilities for cyber resilience.

More concerning still is the possibility of cyberwarfare targeting maritime assets. Attacks on merchant vessels or port facilities by state or state-affiliated actors blur the line between criminal acts and military operations. Existing laws of armed conflict and UNCLOS do not clearly address cyber operations at sea. Legal scholars and policy bodies, including the UN Group of Governmental Experts, have started engaging with these questions, but maritime-specific norms remain undeveloped.[285] Establishing peacetime norms such as prohibitions on targeting civilian maritime infrastructure should be a priority in international negotiations.

In short, cybersecurity has emerged as one of the most pressing legal blind spots in modern maritime governance. While industry and regulators are beginning to respond, a more cohesive, enforceable, and anticipatory legal regime is necessary to protect maritime systems from 21st-century digital threats.

5.4.2 Technological Innovation and Autonomous Vessels

Technological innovation, particularly the rise of autonomous ships, is reshaping maritime law. Maritime Autonomous Surface Ships (MASS) vessels operated with little or no onboard crew, present regulatory dilemmas for legal frameworks built around human-operated ships. Conventions like UNCLOS and SOLAS assume a human master and crew, with terms like “master,” “seafarer,” and “lookout” embedded in core rules.[286]

Yet MASS are no longer theoretical: pilotless ferries and survey ships have operated successfully, and trials for large, unmanned cargo vessels are ongoing. The challenge lies in fitting these innovations into a regime that requires visual lookouts[287] and prescribes responsibilities for crew in emergencies.[288] For example, the COLREGs

[285] *See* Todd Emerson Hutchins, *Maritime Espionage and the Legal Consequences of the United States' Potential Ratification of the United Nations Convention on the Law of the Sea*, 8 Nat'l Sec. L.J. 1 (2021).
[286] IMO, *Regulatory Scoping Exercise for the Use of Maritime Autonomous Surface Ships (MASS)*, IMO MSC.1/Circ.1638 (2021).
[287] COLREGs, Rule 5.
[288] UNCLOS, Art. 98(1).

mandate lookouts by sight and hearing, which is difficult to reconcile with AI systems relying solely on sensors.[289]

The IMO responded by conducting a regulatory scoping exercise (2017-2021), identifying barriers and ambiguities in conventions like SOLAS, MARPOL, and the STCW Code. A non-mandatory MASS Code is being developed to address these issues, with the goal of defining operational roles and degrees of autonomy.[290] One proposed approach is functional equivalence: if a system meets the intent of a rule (e.g., safe navigation), it would be considered compliant.

Liability is another major concern. If an autonomous vessel collides with another due to software failure, assigning fault becomes complex, could responsibility lie with the shipowner, software developer, or remote operator? The idea of strict liability for MASS is gaining traction, mirroring approaches in drone and aviation law. Insurance markets are adapting, anticipating new underwriting models and potentially mandatory coverage akin to pollution insurance.[291]

Autonomous vessels may also change how salvage and rescue laws apply. Current salvage laws reward human life-saving efforts, but if ships lack crews, incentives may shift toward environmental protection or cargo recovery.

5.4.3 Arctic Routes and Geopolitical Shifts

The Arctic's transformation from a frozen frontier to a navigable sea is redrawing the geopolitical map. Climate change-accelerated sea ice loss is creating seasonal access to two important routes: the Northwest Passage across Canadian waters and the Northern Sea Route along the Russian coast.[292] By 2023, around 500 vessels were transiting Arctic waters annually a 37% increase over a decade.[293] Though small in global terms, this trend signals a strategic shift.

Legal complications arise because coastal states namely Canada and Russia, claim sovereign rights over these routes. Based on historical title and straight baselines drawn

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[289] *Id.*
[290] Int'l Mar. Org., *Development of a Non-Mandatory Goal-Based MASS Code*, IMO Doc. MSC 107/WP.9 (2023).
[291] *Maritime Autonomous Surface Ships – Zooming in on Civil Liability and Insurance*, CORE Advokatfirma & Cefor, at 8–10 (2018).
[292] *Arctic Shipping Status Report – Number 2*, Arctic Council (2023), https://oaarchive.arctic-council.org/handle/11374/3121 (last visited May 21, 2025).
[293] *Id.*

around its Arctic Archipelago, Canada claims that the Northwest Passage passes via internal waters.[294] Russia, likewise, regulates the North Sea Route heavily, requiring foreign ships to obtain permits, use Russian ice pilots, and pay fees.[295]

But a lot of states, notably the United States, contend that these are international straits with transit rights. Ships have almost unrestricted rights to cross international straits under UNCLOS, and overbearing coastal state control may be against that agreement.[296] So far, disputes have been diplomatically managed, but legal clarity remains elusive.

Article 234 of UNCLOS, which permits coastal nations to impose pollution-related regulations in ice-covered waters within their EEZs in the event that navigation presents "exceptional hazards", is at the centre of this discussion.[297] Russia and Canada use this to support their stringent regulations. Yet as ice cover declines, the applicability of Article 234 is increasingly questioned.[298] If ice disappears for much of the year, the legal justification for such extensive control may melt away with it.[299]

Proposals for Arctic-specific agreements under organizations like the Arctic Council, which has mediated soft-law cooperation on matters like search and rescue and oil spill response, are part of efforts to balance conflicting claims. However, development has been hindered by geopolitical concerns, particularly those following the invasion of Ukraine.[300]

Environmental issues continue to be of utmost importance. Increased shipping makes the delicate Arctic ecology especially susceptible to spills and disruptions. The IMO's Polar Code, which established environmental and safety requirements for polar operations, went into force in 2017.[301] In an effort to reduce significant pollution

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[294] Ted L. McDorman, *The Northwest Passage as an International Strait: Is Canada's Claim Sustainable?*, 3(1) *J. Mar. L. & Com.* 63 (2009).
[295] *Rules of Navigation in the Water Area of the Northern Sea Route*, approved by Russian Federation Government Decree No. 1487 (Sept. 18, 2020).
[296] UNCLOS, arts. 37–45.
[297] UNCLOS, art. 234.
[298] Stanley P. Fields, *Article 234 of the United Nations Convention on the Law of the Sea: The Overlooked Linchpin for Achieving Safety and Security in the U.S. Arctic*, 7 Harv. Nat'l Sec. J. 80, 86–88 (2016).
[299] Timo Koivurova, *Limits and Possibilities of the Arctic Council in a Rapidly Changing Scene of Arctic Governance*, 46 *Polar Record* 146, 149 (2010).
[300] Marlène Laruelle, *Russia's Arctic Policy: A Power Strategy and Its Limits*, Ifri (Mar. 2020), https://www.ifri.org/en/papers/russias-arctic-policy-power-strategy-and-its-limits.
[301] *International Code for Ships Operating in Polar Waters (Polar Code)*, Int'l Mar. Org., IMO Res. MSC.386(94) (adopted Nov. 21, 2014; entered into force Jan. 1, 2017).

hazards, the IMO has approved a ban on heavy fuel oil (HFO) in the Arctic, which will be implemented gradually starting in 2024.[302]

Indigenous groups are also parties involved. Hunting and fishing are being disrupted by increased Arctic transportation threats.[303] Legal measures must guarantee that their rights and opinions are upheld, possibly by designing routes that steer clear of areas that are important to the environment or culture.

UNCLOS may need to be reinterpreted or supplemented as new trans-Arctic shipping paths become viable. Options include formalizing restrictions on coastal state regulations through regional treaties or IMO routeing procedures, or creating and implementing agreement tailored to Arctic navigation. In the long run, there could be a high seas route in the Arctic that is completely outside of state borders, which would raise serious legal and environmental issues.

5.4.4 Adapting to Climate Change and New Frontiers

The fundamental presumptions of maritime law are being forced to be re-examined due to climate change. The traditional geometry and extent of UNCLOS-based maritime zones are being challenged by rising sea levels, changing coasts, and new ocean usage. Can low-lying island nations retain sovereignty over their EEZs in the event that their land is submerged? This is an existential concern.[304]

Although baselines drawn along the coast are used to calculate maritime zones under UNCLOS, the treaty makes no mention of what occurs when coastlines recede as a result of erosion or flooding.[305] Legal and political discussions of whether baselines should be regarded as fixed once declared or as ambulatory (changing with geography) have been sparked by this silence.[306] Regardless of potential sea level rise, small island

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[302] *Prohibition on the Use and Carriage for Use as Fuel of Heavy Fuel Oil by Ships in Arctic Waters*, Int'l Mar. Org., IMO Res. MEPC.329(76) (adopted June 17, 2021).
[303] *Arctic Connected: The Arctic's Indigenous Communities Under Threat*, WWF Arctic Programme (Dec. 19, 2022), https://www.arcticwwf.org/newsroom/features/arctic-connected-the-arctics-indigenous-communities-under-threat/ (last visited May 20, 2025).
[304] David Freestone, *International Law and Sea Level Rise: Recent Developments*, 36 Int'l J. Marine & Coastal L. 245, 247–48 (2021).
[305] UNCLOS, arts. 5–7.
[306] Clive Schofield & David Freestone, *Options to Protect Coastlines and Secure Maritime Jurisdictional Claims in the Face of Global Sea Level Rise*, in *Threatened Island Nations: Legal Implications of Rising Seas and a Changing Climate* 141, 141–65 (Michael B. Gerrard & Gregory E. Wannier eds., Cambridge Univ. Press 2013).

developing states (SIDS), particularly in the Pacific, are making a stronger case for permanent maritime claims.

The Pacific Islands Forum affirmed in 2021 that current marine rights must not be undermined by climate change. According to the proclamation, marine zones created under UNCLOS ought to stay stable in order to foster legal clarity and shield weaker governments from additional losses.[307] Legal experts have defended this stance, and the International Law Commission (ILC), which started looking into the legal ramifications of sea level rise in 2019, has discussed it.[308]

Beyond national jurisdiction operations and deep-sea mining represent another legal frontier. Under Part XI of UNCLOS, the International Seabed Authority (ISA) was created to regulate the mining industry in the deep ocean, which is known as the "common heritage of mankind".[309] Businesses are becoming more interested in collecting polymetallic nodules from the seafloor as the need for rare earth minerals for green technology increases.

However, proposals for a moratorium on deep-sea mining until more information is available have arisen due to worries about ecosystem destruction. There is not a formal regulation in place yet, but the ISA is working on a comprehensive Mining Code.[310] Some states and environmental organizations support a precautionary approach, claiming that the possible harm might be irreversible.

Additionally, the Biodiversity Beyond National Jurisdiction (BBNJ) pact, which was adopted in 2023 under UNCLOS, is bringing innovation to the governance of the high seas. The objectives of this agreement are to create marine protected areas, control marine genetic resources, and guarantee benefit-sharing between nations.[311] It is a

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[307] *Declaration on Preserving Maritime Zones in the Face of Climate Change-related Sea-Level Rise*, Pacific Islands Forum (Aug. 6, 2021), https://forumsec.org/publications/declaration-preserving-maritime-zones-face-climate-change-related-sea-level-rise/ (last visited May 25, 2025).
[308] Bogdan Aurescu & Nilüfer Oral, *Sea-Level Rise in Relation to International Law: First Issues Paper by Co-Chairs of the Study Group on Sea-Level Rise in Relation to International Law*, U.N. Doc. A/CN.4/740 (Feb. 28, 2020).
[309] UNCLOS, art. 136.
[310] International Seabed Authority, *Draft Regulations on Exploitation of Mineral Resources in the Area*, U.N. Doc. ISBA/25/C/WP.1 (Mar. 22, 2019)
[311] United Nations, *Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction*, U.N. Doc. A/CONF.232/2023/6 (June 19, 2023)

significant step in maintaining the cooperative spirit of UNCLOS while expanding it to new problems.

Lastly, UNCLOS hardly addresses some technological boundaries, such underwater data cables, which form the foundation of the world's internet infrastructure. Beyond the broad freedom-of-navigation principles, these cables have little legal protection, despite their significance. There is growing demand for a stronger legal framework to oversee and safeguard underwater cables as their security is increasingly threatened by both natural and man-made factors.[312]

Collectively, these advancements highlight a key idea: expanding and interpreting UNCLOS to address new issues, rather than revising it, is how maritime law will develop in the future. The long-standing practice of modifying the law of the sea to reflect evolving circumstances is carried on by this evolutionary approach through proclamations, new agreements, and institutional procedures.

5.5 Conclusion

The analysis makes it evident that maritime law in the twenty-first century must address two pressing issues: fixing the system's flaws and modifying it to reflect new realities. The legal order at sea and the dependability of maritime commerce are in danger of being undermined by problems including unequal enforcement, dependence on outdated doctrines, and a failure to adequately integrate contemporary issues like climate change, cyber threats, and autonomous technology. However, these difficulties also make room for creativity. Long-standing inadequacies can be filled by legal reforms aimed at improving port state control, bolstering flag state responsibility, and integrating sustainability and human rights into marine governance.[313]

Positive indications of advancement are appearing. Although it exposed legal problems, the international handling of the *Ever Given* congestion in the Suez Canal ultimately demonstrated the system's capacity to resolve conflicts through diplomacy and accepted principles. Notably, in a completely contemporary setting, it rekindled interest

[312] Rishi Sunak, *Undersea Cables: Indispensable, Insecure*, Policy Exchange (2017), available at https://policyexchange.org.uk/publication/undersea-cables-indispensable-insecure/.
[313] Ioannis Chapsos, James Malcolm & Robert McCabe, *UNCLOS: The Law of the Sea in the 21st Century*, HL Paper 159, UK Parliament (Mar. 1, 2022), available at https://committees.parliament.uk/publications/9005/documents/159002/default/.

in outdated ideas like general average. The IMO's 2023 commitment to aim for net-zero carbon emissions from international shipping by 2050 demonstrates that multilateralism is still successful at the policy level when priorities line up.[314] Similar to this, cooperative means like the Arctic Council agreements[315] and the Polar Code have so far been used to resolve the potentially controversial opening of Arctic Sea routes. These systems prioritize environmental conservation and safety over uncontrolled competition. Proposals like a UNCLOS implementing agreement on modern issues or a special marine cybersecurity treaty are gaining traction in intellectual and diplomatic circles.

In the future, maritime law needs to carefully combine reform with incrementalism. The fundamental frameworks particularly the IMO and UNCLOS conventions remain crucial pillars of legal coherence. Updates, procedures, and interpretative tools should be used to maintain and improve them. Yet, in light of new situations like AI-driven ships or climate-driven displacement, the law cannot continue to be bound by outdated ideas. Although the ocean has always demanded legal order, this order must change with foresight, inclusivity, and flexibility as technology advances, and the world community grows more interconnected.

In the end, filling in the gaps in maritime law entails making sure that no region of the ocean is left ungoverned. In order to safeguard not only shipping interests but also seafarers, coastal communities, and maritime ecosystems, it urges modernizing standards to involve a variety of stakeholders. It imagines a digitized and decarbonized marine future in which risk is handled honestly and openly, and crewless ships continue to function under responsible supervision. In order to address transboundary issues that no one country can handle on its own, it also calls for a reaffirmation of collective responsibility, the same ethos that gave rise to UNCLOS. In the coming century, maritime law may continue to be a pillar of international trade, environmental preservation, and amicable collaboration with bold change and unwavering dedication to execution.

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[314] International Maritime Organization, *Resolution MEPC.377(80): 2023 IMO Strategy on Reduction of GHG Emissions from Ships*, IMO Doc. MEPC 80/WP.12 Annex 1 (July 7, 2023)
[315] *Agreements and Cooperation*, Arctic Council, https://arcticcouncil.org/explore/work/cooperation/ (last visited May 21, 2025).

CHAPTER 6: CONCLUSION

6.1 Summary

Maritime law has evolved over centuries, from foundational sources like the *Lex Rhodia* and the *Rolls of Oléron*, through the enactment of national statutes and pivotal court decisions, to the complex international regulatory system that underpins global trade today. With over 80% of the world's goods transported by sea, this movement depends on a robust legal infrastructure including standardized contracts, liability frameworks, and safety regulations that reduces risk and streamlines operations. In the absence of such legal mechanisms, the efficient and reliable flow of goods across borders would be significantly more difficult.

At the centre of contemporary ocean governance stands the 1982 UNCLOS, often dubbed the oceans' constitution. UNCLOS sets out territorial limits, navigational rights and mechanisms for settling disputes, while specialised agencies most notably the IMO, maintain detailed conventions on safety (SOLAS), pollution control (MARPOL), crew training (STCW) and more. Added to these is the Maritime Labour Convention 2006, frequently described as a seafarers' bill of rights. Yet, the effectiveness of this architecture ultimately rests on how firmly individual states enforce the rules.

Pirate activity in the Somali and the Houthi attacks, for example, has exposed enforcement gaps and raised questions about jurisdiction and prosecution, showing that even a well-developed legal framework must keep evolving to meet new threats. Despite global efforts, incidents persist in various regions, highlighting the absence of a permanent enforcement mechanism. Environmental challenges are also pressing. Although international law has curbed many types of ship-generated pollution, shipping remains a significant contributor to carbon emissions responsible for roughly 2–3% of global CO_2 output. Climate change introduces legal complexities. Rising seas may redefine maritime boundaries, while melting polar regions open new routes needing regulation. Recent efforts, such as the 2023 High Seas Biodiversity Treaty, reflect growing concern over marine conservation beyond national jurisdictions. Technology presents another frontier. Maritime automation, including autonomous vessels, is outpacing the legal language still built around human crews. Questions of liability, insurance, and command are increasingly complex. Meanwhile, cyber threats like the

2017 NotPetya attack, which disrupted major shipping lines, expose vulnerabilities in a system unprepared for digital sabotage.

The analysis explored potential reforms in three critical areas: enhancing enforcement incentives for states, embedding human rights more explicitly within maritime governance, and establishing binding climate commitments for the shipping industry. Recommended measures include tightening flag state regulations, expanding the scope of port-state control, safeguarding the rights of migrant seafarers, and advancing the implementation of climate initiatives through the IMO. The overarching conclusion is that, although the existing legal framework has effectively supported global trade, it must now undergo focused reforms to address the evolving demands of the modern maritime landscape.

6.2 Key Findings

- Chapters 2 and 3 traced a lineage from Rhodian jettison rules to UNCLOS and the modern liability conventions. That longitudinal view confirmed the ocean's legal order has always evolved by accretion, not revolution a trait that helps explain why UNCLOS still frames 80 % of global trade flows. Yet the same incrementalism also slows reaction time when disruptive forces, climate change, automation, great-power rivalry arrive in clusters.
- The study found that jurisdiction still hinges on the flag, a rule exploited by "open" registries such as Liberia and Panama. Loose oversight in those venues perpetuates safety, labour, and pollution violations, proving that the famous "genuine link" requirement in Article 91 has little bite in practice. Regional port-state-control regimes have mitigated some abuse, but only patchily and with uneven resources.
- While the 2006 Maritime Labour Convention (MLC) codified a global floor for seafarer welfare, its effectiveness still rides on the very flag-state system whose deficiencies are documented above. Implementation gaps especially in smaller flag states leave crews vulnerable to wage theft, abandonment, or piracy-related trauma.
- The IMO's 2023 net-zero strategy, together with MARPOL Annex VI sulphur caps, constitutes the clearest sign that decarbonisation is no longer aspirational. Yet these measures remain protocol-based add-ons: failure to meet them triggers political embarrassment more readily than hard sanctions. For climate-threatened small-

island states, rising seas are not just ecological but jurisdictional eroding the very baselines from which maritime zones are measured.

- Autonomous ships, remote-operation centres, and AI-driven navigation are pounding square pegs into round treaty holes. Key safety instruments (COLREGs, SOLAS, STCW) presuppose a human lookout; they do not say where the master sits when the bridge is onshore. The IMO's forthcoming MASS Code will close some gaps, yet liability rules, collision apportionment, and cyber-risk allocation remain unsettled.
- Somali piracy, Gulf of Guinea kidnappings, and Strait of Hormuz tanker attacks illustrate how maritime threats jump legal categories from private crime to state-linked sabotage. UNCLOS offers only minimalist tools beyond piracy, forcing ad-hoc Security Council resolutions and regional codes (Yaoundé, Djibouti) to fill the void. Dispute-resolution pluralism (ICJ, ITLOS, Annex VII tribunals) supplies flexibility but also risks contradictory rulings, as dramatized by the South China Sea award.

6.3 Recommendations for Strengthening Maritime Governance

The following proposals aim to modernize global maritime governance through practical legal reforms. The core idea is that while UNCLOS and existing instruments remain relevant, targeted updates can bridge critical gaps particularly in flag state accountability, human rights protections, and climate compliance.

i. Holding Flag and Port States Accountable

Enforcement gaps remain a persistent problem, particularly with "flags of convenience" registries that offer lax oversight in exchange for fees. These flags are disproportionately linked to substandard ships, environmental violations, and labour abuses. To counter this, a multi-pronged approach is recommended:

- Develop a global flag performance index: An IMO-backed scoring system could rank flag states using indicators such as accident rates and enforcement history. Public white and black lists would exert reputational pressure on underperformers.

- Use port state control as leverage: Ports should reward compliant ships (e.g., faster processing, lower fees) and penalize non-compliant ones through stricter inspections and potential denial of entry. A harmonized, risk-based approach to inspections would encourage higher standards across registries.
- Pursue an implementing agreement under UNCLOS: A new treaty could introduce mandatory audits, peer review, and even sanctions for egregious non-compliance. Such a mechanism would give force to existing obligations, ensuring flag states either take responsibility or face consequences.

ii. Embedding Human Rights in Maritime Law

Despite progress through the Maritime Labour Convention 2006, the legal regime still under protects seafarers and vulnerable individuals at sea. To address this:

- Mandate human rights due diligence: Flag states and shipowners should be required to assess and mitigate human rights risks, integrating these responsibilities into existing audit mechanisms like the IMO Member State Audit Scheme.
- Expand port inspections to include labour conditions: Port state control could routinely check for violations such as wage theft or unsafe living conditions, detaining ships until they comply.
- Support a new legal instrument on human rights at sea: A standalone treaty or UNCLOS implementing agreement could consolidate rights protections and clarify jurisdiction over abuses like forced labour, assault, and abandonment.
- Tackle flags of convenience from a rights-based lens**:** Poor flag governance often correlates with labour exploitation. States should consider legal avenues to hold such flags accountable, including port-based penalties and transparency measures such as fair shipping certifications.

iii. Making Decarbonization Legally Binding

Climate change presents the most pressing long-term threat to maritime sustainability. Although the IMO's GHG strategy sets ambitious goals, it remains largely aspirational. Effective reform requires enforceability:

- Adopt binding GHG targets: Amend MARPOL or negotiate a new convention to mandate zero emissions by 2050, with interim targets along the way.
- Introduce a global carbon pricing mechanism: A levy or cap-and-trade system could incentivize cleaner shipping. The IMO has already advanced draft rules to this effect in 2025, and implementation should proceed swiftly.
- Enforce compliance through port controls: Ports should require emissions certificates and penalize ships that fail to meet standards. Green port incentives could further reward sustainable practices.
- Improve transparency and liability: Disclose ship emissions data publicly to allow market accountability. In cases of extreme non-compliance, explore liability models akin to oil spill compensation regimes.

Together, these reforms aim to modernize a system that has historically supported global trade but now faces new tests. Strengthening flag state enforcement, embedding human rights, and codifying decarbonization are not just legal necessities they are strategic imperatives for a more just, resilient, and sustainable maritime order.

6.4 Future Directions in Maritime Legal Research

Although this dissertation has addressed major aspects of maritime law, several emerging domains warrant deeper academic exploration. Rapid developments in technology, shifting geopolitical dynamics, and escalating environmental challenges are raising pressing legal questions that will significantly influence the future direction of the field.

- Maritime Cybersecurity

Digital integration in shipping has created serious vulnerabilities. The 2017 NotPetya ransomware attack on Maersk, which disrupted global logistics, illustrated the scale of potential cyber threats. Future research should examine how international law might categorize such maritime attacks particularly when linked to state sponsorship as breaches of the peace or acts of aggression under the UN Charter. This line of inquiry could clarify state responsibility, guide lawful responses, and help close existing legal

grey areas in maritime security. Further inquiry is needed into liability: Who is responsible for cybersecurity failures shipowners, ports, or software providers? Scholars should also evaluate whether IMO guidelines (such as Resolution MSC.428(98)) should become binding and whether cyber incident reporting should be made mandatory.

- Arctic Navigation and Polar Governance

Climate change is opening new shipping routes in the Arctic, particularly the Northern Sea Route and the Northwest Passage. Disputes over legal status such as Canada's claim to internal waters versus claims of international passage warrant further legal analysis. The Polar Code, while a major step, has gaps in addressing emergency response, environmental risks, and the rights of indigenous communities. Future research could assess whether new regional treaties or amendments to existing instruments like UNCLOS are necessary to manage this evolving zone of activity.

- Autonomous Shipping and AI

Autonomous vessels could transform maritime transport, but legal frameworks lag behind. Key issues include whether traditional concepts like the master of a vessel can be applied to AI systems or remote operators, and how liability should be assigned for AI-driven incidents. This also raises labour law concerns, and widespread automation could displace thousands of seafarers. Legal research should adopt an interdisciplinary lens, combining maritime law with AI ethics, product liability, and employment law. Pilot projects in Norway and elsewhere offer valuable case studies.

- Climate Litigation in Shipping

Litigation related to maritime emissions is a growing risk. Cases have already emerged where shipping companies face legal action for misleading environmental claims. Future lawsuits could target flag States or companies over their contribution to climate change, following trends seen in the fossil fuel sector. Scholars should examine how tort law, international environmental law, and human rights instruments might apply to hold maritime actors accountable. Legal challenges may also arise against regulators like the IMO for insufficient action.

6.5 Conclusion

These areas reflect the dynamic challenges facing maritime law in the 21st century. The discipline must now grapple with cybersecurity, AI, polar governance, and climate accountability complex problems that sit at the intersection of law, science, and policy. Actively engaging with emerging challenges will help keep maritime law a resilient and flexible system for managing ocean governance amid ongoing global shifts.

Maritime law has always evolved alongside human activity at sea. Today, the oceans are more critical than ever to commerce, to climate stability, and to international order. It has shown that while the current legal structure is robust, it must continue to adapt. With smart regulation and international cooperation, maritime law can meet the demands of our time, ensuring that the oceans remain governed not by disorder, but by the rule of law.

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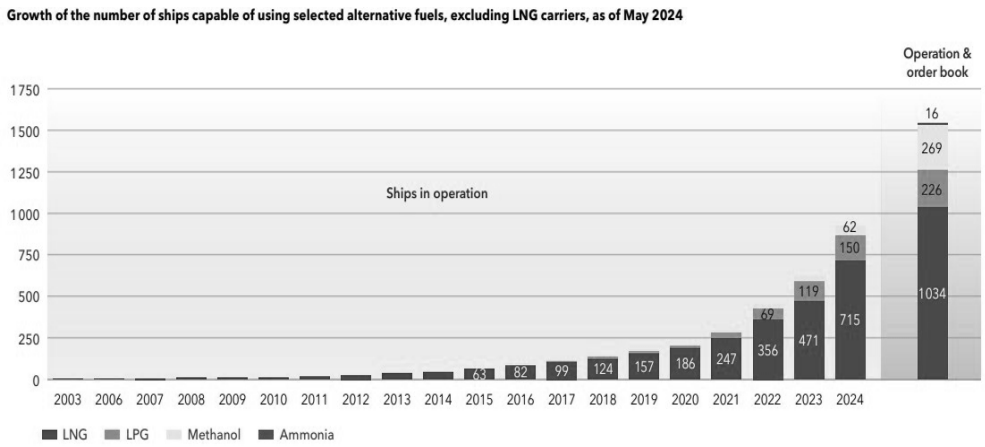
APPENDIX

- 2024 Maritime Forecast to 2050

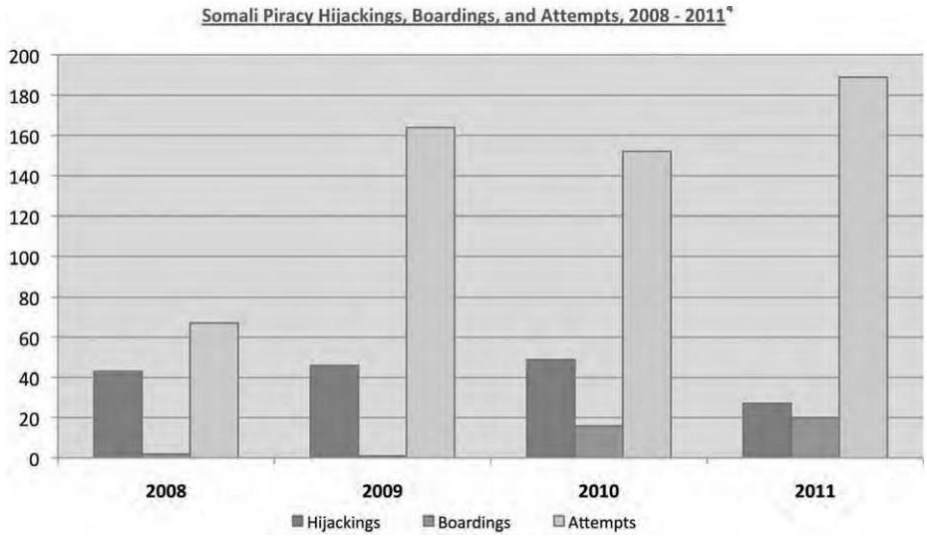
Figure 1



Source: DNV Energy Transition Outlook 2024 - Maritime Forecast to 2050

- Somali Piracy Hijackings, Boardings, and Attempts, 2008-2011

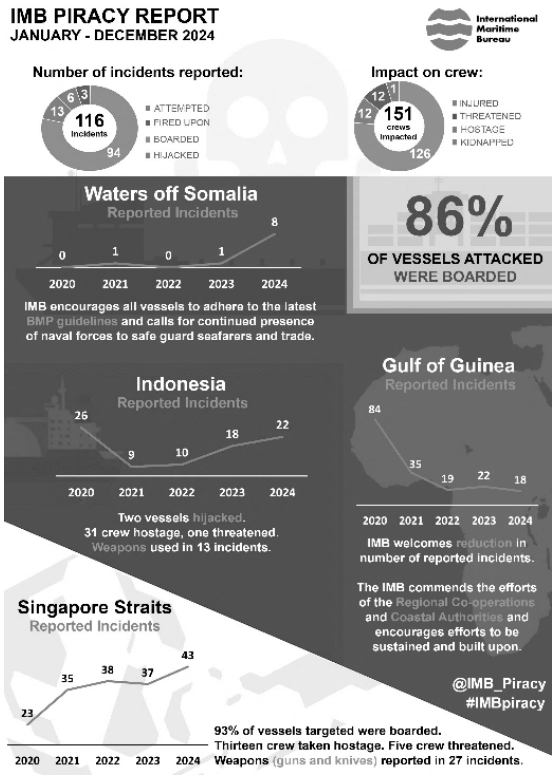
Figure 2



Source: *Oceans Beyond Piracy*, *The Economic Cost of Somali Piracy 2011*, One Earth Future Foundation (2011)

- Maritime Piracy and Crew Safety in 2024

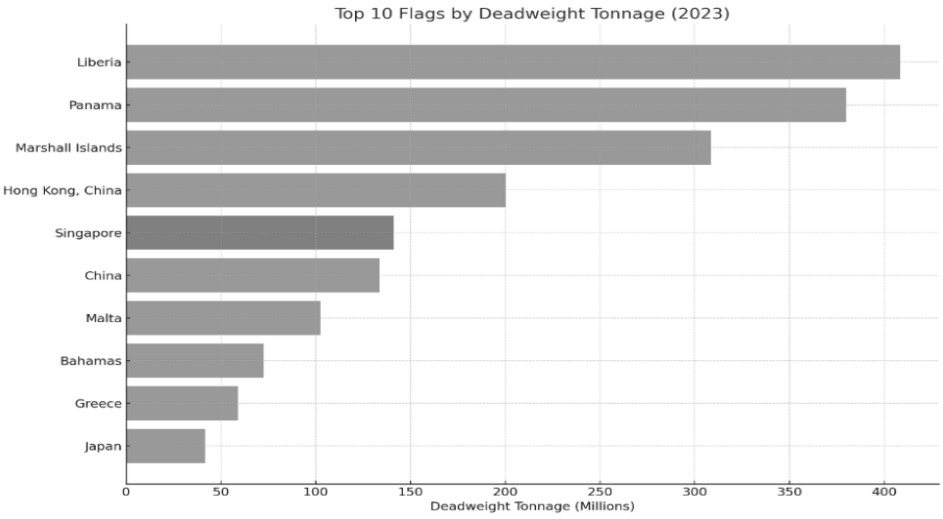
Figure 3



Source: ICC Commercial Crime Services (CSS)

- Top 10 Flags by Deadweight Tonnage (2023)

Figure 4



Source**:** UNCTAD (2023), Clarkson Research (2023)

APPENDIX

THE NATIONAL UNIVERSITY OF ADVANCED LEGAL STUDIES
Kalamassery, Kochi – 683 503, Kerala, India

CERTIFICATE ON PLAGIARISM CHECK

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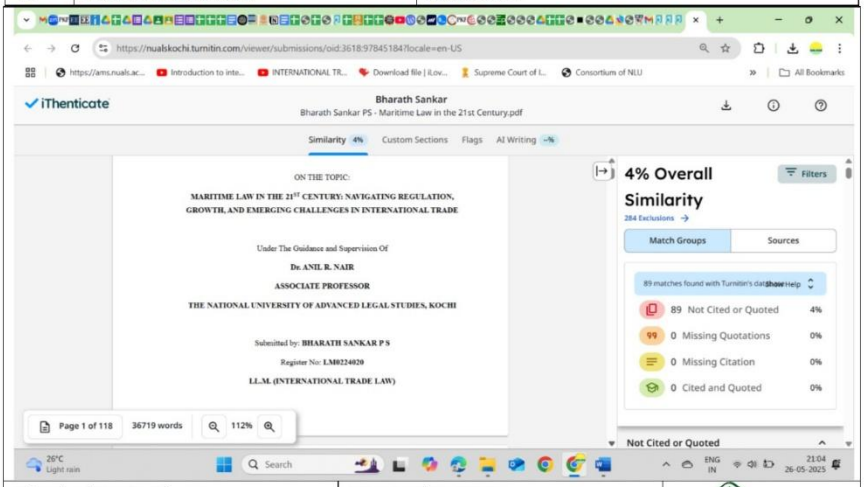

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