

## Reconstructing liquefied natural gas charter party clauses to address emission obligations under international shipping decarbonisation

Alqadri Wijaya Putra<sup>1\*</sup>, Mickray Goldsteina Sombowadile<sup>2</sup>, Muhammad Haikal Kafi<sup>3</sup>

<sup>1,2,3</sup> Law, Universitas Padjadjaran, Bandung, Indonesia

**Abstract:** The global energy transition has accelerated the adoption of Liquefied Natural Gas (LNG) as a transitional marine fuel, yet its expanding use in shipping increasingly conflicts with stricter decarbonisation requirements under the International Maritime Organization (IMO) regime, creating tension within existing contractual frameworks. This study employs a normative (doctrinal) legal research methodology, integrating statutory, conceptual, and comparative approaches to examine MARPOL Annex VI amendments, standard LNG charter party forms issued by BIMCO and GIIGNL, and relevant maritime law and engineering literature. The analysis evaluates the alignment of these instruments with the Energy Efficiency Existing Ship Index (EEXI) and Carbon Intensity Indicator (CII), both mandatory since January 2023. Findings reveal four key contractual gaps: lack of clear CII responsibility allocation, conflict between speed warranties and emission-driven reductions, absence of methane emission regulation for boil-off gas and engine slip, and resulting legal uncertainty and compliance risks. To address these issues, the study proposes four model clauses Emission Responsibility, CII Compliance, Speed-Emission Adjustment, and LNG Methane Emission based on control-based liability and causation-based cost allocation, positioning LNG charter parties as instruments of both commercial governance and environmental compliance.

**Keywords:** LNG shipping; charter party; carbon intensity indicator (CII); decarbonisation; methane emissions; maritime contract law; MARPOL Annex VI

### 1. Introduction

The global energy transition has fundamentally altered the landscape of international shipping, propelling Liquefied Natural Gas (LNG) into a central role as a transitional fuel in the maritime sector. LNG is widely regarded as a cleaner-burning alternative to conventional fossil fuels, producing substantially lower sulphur oxide (SOx) and particulate matter emissions, and approximately 20–25% less carbon dioxide (CO<sub>2</sub>) per unit of energy generated compared to heavy fuel oil (International Maritime Organization, 2008). Consequently, demand for LNG as a marine fuel has grown substantially, accompanied by a marked intensification in the volume of LNG cargo transportation conducted through maritime charter arrangements. These two dynamics the commercial growth of LNG shipping and the progressive tightening of environmental regulations are not merely parallel developments; they converge directly upon the contractual mechanisms that govern the relationship between shipowners and charterers.

The regulatory architecture underpinning decarbonisation in international shipping is anchored in the regime of the International Maritime Organization (IMO), specifically in amendments to the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI. These amendments, which entered into force on 1 November 2022, introduced two critical instruments: the Energy Efficiency Existing Ship Index (EEXI) and the Carbon Intensity Indicator (CII), both of which became mandatory from 1 January 2023 (International Maritime Organization, 2022). The EEXI establishes a minimum technical efficiency standard for existing ships based on design parameters and installed propulsion capacity, whereas the CII operates as an operational metric that rates a vessel's annual carbon intensity performance on a scale from A (superior) to E (inferior) based on

#### Correspondence:

Name: Alqadri Wijaya Putra

Email: alqadri22001@mail.unpad.ac.id

Received: Apr 24, 2026;

Revised: May 11, 2026;

Accepted: Jun 16, 2026;

Published: Jun 30, 2026;



**Copyright:** © 2026 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

its actual transport work and associated emissions (Wu et al., 2025). Vessels rated D for three consecutive years or E for a single year are legally obligated to develop and implement corrective action plans within their Ship Energy Efficiency Management Plans (SEEMPs), potentially facing operational restrictions in certain ports (Tadros et al., 2024).

The broader strategic context for these measures is provided by the IMO's 2023 Revised GHG Strategy, which replaced the 2018 Initial Strategy and committed the international shipping sector to achieving net-zero greenhouse gas emissions by or around 2050, with interim reduction targets of at least 20–30% by 2030 and 70–80% by 2040 relative to 2008 baselines (International Maritime Organization, 2023). While these ambitions represent a significant advance in international shipping policy, scholars have raised concerns regarding the IMO's capacity to develop a sufficiently consistent, comprehensive, and technically robust regulatory framework to meet these targets given persistent limitations in institutional capacity and political consensus among member states (Bach & Hansen, 2023). These structural uncertainties at the international regulatory level inevitably translate into legal and contractual uncertainty at the level of private maritime law.

The central legal problem addressed in this study arises at precisely this intersection of public international regulation and private contractual law. The charter party the foundational contract of carriage in maritime commerce has historically operated upon a classical model of risk allocation between the shipowner and the charterer. Under conventional time charter arrangements, the owner bears responsibility for the vessel's technical condition, seaworthiness, and operational performance, while the charterer bears responsibility for commercial deployment, voyage instructions, and freight-related obligations (Plomaritou & Voudouris, 2019). However, this traditional binary allocation does not adequately capture the novel and more complex distribution of responsibility necessitated by the EEXI and CII regimes. The CII rating of a vessel is a function not only of the ship's technical capabilities within the owner's sphere of control but also of the charterer's operational decisions, including voyage instructions, speed orders, port call frequency, and cargo selection (Arcan et al., 2025). Consequently, the question of which party bears legal and financial responsibility for compliance failures, corrective costs, or commercially disadvantageous speed reductions cannot be resolved with certainty under existing standard-form charter party arrangements.

This problem is further compounded in the specific context of LNG charter parties by the presence of issues unique to cryogenic cargo operations. LNG transportation inherently involves the generation of boil-off gas (BOG) as a result of heat ingress into the cargo tanks during transit. If not managed or utilised, BOG releases contribute to methane emissions, which carry a global warming potential approximately 80 times greater than CO<sub>2</sub> over a 20-year period (Lehtoranta et al., 2023). Moreover, dual-fuel and gas-injection propulsion systems used in LNG carriers may produce methane slip unburned methane passing through the combustion cycle further elevating the actual greenhouse gas intensity of vessel operations beyond what is captured in conventional CO<sub>2</sub>-equivalent reporting (Herdzik, 2018). Neither the standard voyage charter forms, such as LNGVOY, nor the existing standard time charter clauses developed by the Baltic and International Maritime Council (BIMCO) for LNG operations contain explicit provisions addressing the allocation of responsibility for methane emissions arising from BOG management or methane slip.

The existing body of scholarship on this subject has addressed aspects of the broader decarbonisation challenge in shipping, including techno-economic analyses of EEXI and CII compliance, speed optimisation models, and financial impact assessments on vessel valuation (Bayraktar & Yuksel, 2023). Scholarly attention has also been directed toward the general interaction between environmental regulation and charter party frameworks (Boviatsis, 2023). However, no study to date has systematically examined the contractual gap in LNG-specific charter party instruments in relation to the full spectrum of emission obligations arising under the current decarbonisation regime encompassing CII responsibility allocation, speed-emission conflicts, and methane emission governance and

proposed a model for clause reconstruction that addresses these lacunae while preserving the commercial integrity of LNG charter arrangements.

This study addresses that gap. It proceeds from the premise that the existing charter party framework for LNG shipping contains a structural contractual gap (contractual lag) that renders it ill-suited to the present regulatory environment. The study's primary objectives are threefold: first, to identify and characterise the normative incompatibilities between existing LNG charter party structures and the obligations imposed by the IMO decarbonisation regime; second, to analyse the legal consequences of these incompatibilities for the parties to LNG charter agreements; and third, to propose a model for the reconstruction of LNG charter party clauses that integrates emission responsibility allocation, CII compliance obligations, speed-emission adjustment mechanisms, and methane emission governance. In so doing, this research aims to contribute to the development of international maritime economic law in a manner that is simultaneously responsive to the environmental imperatives of the post-2023 regulatory order and respectful of the legitimate commercial interests of owners and charterers engaged in global LNG transportation.

## 2. Materials and Methods

This study adopts a normative legal research design, commonly referred to as doctrinal legal research, which focuses on the systematic identification, interpretation, and synthesis of legal rules, principles, and doctrines relevant to the research problem. Such an approach is particularly appropriate where the central issue concerns normative inconsistencies between regulatory obligations and contractual arrangements. In this context, doctrinal analysis enables a structured examination of the extent to which existing charterparty clauses accommodate the decarbonisation framework introduced by the International Maritime Organization (Bhat, 2020; Hutchinson, 2015). Foundational methodological guidance is drawn from established legal scholarship, which emphasises the hierarchical use of legal materials and the importance of analytical coherence in normative inquiry.

The study employs a descriptive–analytical method within the doctrinal framework. The descriptive component systematically maps the applicable legal instruments, contractual standards, and scholarly discourse, while the analytical component critically evaluates the alignment between existing charter party practices and the evolving regulatory regime governing greenhouse gas emissions in shipping. This dual approach facilitates both an accurate representation of the current legal landscape and a reasoned assessment of its deficiencies. The analysis is further informed by interdisciplinary perspectives, particularly where legal interpretation intersects with technical and economic considerations in maritime operations.

Three complementary legal approaches are utilised. First, the statutory and regulatory approach examines the primary international instruments governing maritime emissions, including MARPOL Annex VI and its subsequent amendments, as well as the introduction of the Energy Efficiency Existing Ship Index (EEXI) and the Carbon Intensity Indicator (CII) through IMO resolutions MEPC.350(78) and MEPC.352(78) (International Maritime Organization, 2008, 2022). The analysis also incorporates the 2023 IMO Strategy on the Reduction of Greenhouse Gas Emissions from Ships, which provides the most recent policy direction for global maritime decarbonisation (International Maritime Organization, 2023). Second, the conceptual approach is applied to examine the legal doctrines underpinning charter party agreements, including risk allocation, contractual performance, and good faith, alongside emerging concepts related to environmental compliance and emissions accountability (Plomaritou & Voudouris, 2019). Third, a comparative approach is undertaken to evaluate standard-form contractual instruments developed by BIMCO and the GIIGNL, including LNGVOY and the CII-related clauses for time and voyage charterparties (Bimco, 2022). This comparison enables the identification of normative gaps and the assessment of existing industry responses to regulatory change.

The legal materials used in this research are categorised into primary and secondary sources. Primary legal materials consist of binding or authoritative instruments, including international conventions, IMO resolutions, and standard-form charter party documents widely used in maritime practice. Secondary materials include peer-reviewed journal articles, academic monographs, and industry reports that provide interpretation, critique, and contextual analysis of the primary sources. These include studies addressing the legal and operational implications of CII (Tadros et al., 2024; Wu et al., 2025), critiques of current decarbonisation policies (Bach & Hansen, 2023), and technical analyses of emissions in LNG shipping, particularly methane-related impacts (Herdzik, 2018; Lehtoranta et al., 2023). Additional studies examining compliance strategies and economic implications of EEXI and CII further support the analysis (Bayraktar & Yuksel, 2023; Hua et al., 2024)

Data collection was conducted through systematic library research, encompassing both physical and digital sources. Academic databases such as Scopus, Web of Science, and Google Scholar were utilised to identify relevant peer-reviewed literature, while official documents were obtained directly from the IMO and BIMCO repositories. The collected materials were analysed qualitatively using a structured descriptive–analytical technique. The analysis proceeded in three stages: first, the identification and precise description of the applicable regulatory and contractual frameworks; second, a critical comparison to identify inconsistencies, ambiguities, or gaps; and third, the development of normative arguments aimed at reconstructing charter party clauses in a manner consistent with both regulatory requirements and commercial practice.

Throughout the analysis, particular attention is given to the specific characteristics of liquefied natural gas (LNG) shipping, including methane slip, boil-off gas management, and the technical complexities of cryogenic cargo operations. These factors are significant due to the high global warming potential of methane and their direct relevance to CII performance metrics. By integrating legal, technical, and economic perspectives, this methodological framework provides a robust basis for evaluating the contractual implications of maritime decarbonisation and for proposing legally coherent and practically applicable solutions.

### 3. Results and Discussion

#### 3.1. Structure and Character of the LNG Charter Party

LNG charter parties occupy a distinctive position within the broader taxonomy of maritime contracts. At their foundation, they function as instruments for allocating rights, obligations, commercial risks, and operational costs between shipowners and charterers across the full lifecycle of a chartering engagement (Plomaritou & Voudouris, 2019). However, the object of carriage liquefied natural gas imparts upon these agreements a degree of technical complexity that distinguishes them qualitatively from standard dry bulk or even conventional tanker charter parties. LNG is transported in a cryogenic state at approximately  $-162^{\circ}\text{C}$  under near-atmospheric pressure, rendering it inherently volatile, subject to continuous phase transition through boil-off, and highly sensitive to terminal compatibility, cargo tank condition, and propulsion technology. These technical specificities are not merely operational background context; they directly shape the legal structure of the charter party and the distribution of risk between the contracting parties.

The historical trajectory of LNG charter parties reflects the broader commercial evolution of the LNG trade. For much of its modern history, LNG shipping was conducted under long-term time charters adapted from the Shelltime 4 form and its LNG-specific successor, ShellLNGTime, which provided for extended commitments suited to the infrastructure-intensive, capital-heavy character of early LNG projects. However, as the global LNG market matured and a liquid spot market developed from the mid-2000s onwards, demand emerged for a standardised voyage charter instrument capable of accommodating shorter-term, transactional LNG cargoes. This demand led BIMCO and the International Group of Liquefied Natural Gas Importers (GIIGNL) to jointly publish LNGVOY in 2016—the first standard-form voyage charter party designed specifically for the LNG

spot trade (BIMCO & GIIGNL, 2016). LNGVOY addressed four issues that are structurally unique to LNG voyage chartering: the management of boil-off gas through a negotiated BOG cap; cargo heel retention upon completion of discharge; tank conditioning upon arrival at the loading port; and terminal compatibility warranties.

Within the LNGVOY framework, risk allocation in the voyage charter context is mediated primarily through the laytime and demurrage mechanism rather than through the off-hire provisions characteristic of time charters. As Schofield has observed, the laytime clause including its provisions for interruptions and exceptions functions as the primary instrument through which the risk of delay is distributed between the parties: delays attributable to the vessel's condition or readiness remain the owner's burden, while delays attributable to terminal congestion or charterer operations flow to the charterer through demurrage obligations (Schofield, 2021). This allocation logic is workable in a purely commercial context but does not extend to the novel category of delay and performance loss that arises from emission compliance requirements, such as mandatory speed reductions undertaken to preserve a vessel's CII rating.

In the time charter context, BIMCO has progressively developed a suite of LNG-specific clauses to address the operational peculiarities of LNG carriage, including the LNG Fuel Quality Clause, the LNG Fuel Delivery Clause, and the LNG Fuel Gas-freeing and Cool-down Clause (BIMCO, 2021). These instruments address the contractual relationship between the parties with respect to fuel specification and delivery, and the technical management of cargo tanks during off-hire periods. However, they were drafted against a regulatory background that did not yet include the EEXI and CII regimes, and their scope does not extend to the allocation of emission compliance responsibilities. The result is a structural gap between the technical sophistication of existing LNG charter party instruments and the demands of the post-2023 regulatory environment.

The classical risk allocation model in LNG charter parties assigns the owner responsibility for the vessel's technical condition, seaworthiness, and operational performance, while the charterer bears responsibility for commercial deployment, voyage instructions, and in the LNG context aspects of fuel quality and compliance with cargo specifications (Plomaritou & Voudouris, 2019). This binary framework, while commercially logical in its original design, produces significant normative ambiguity when applied to emission compliance obligations. The CII rating of an LNG vessel is a function of both its technical characteristics over which the owner has primary control and its operational deployment patterns, including voyage distance, speed, port call frequency, and ballast ratios over which the charterer exercises predominant influence through the giving of employment instructions (Arıcan et al., 2025). The charter party, as currently constituted, does not resolve which party bears the legal and financial consequences of a deteriorating CII rating driven by the other's operational or technical choices.

In sum, the LNG charter party presents a hybrid character: it retains the foundational architecture of classical risk allocation whilst incorporating an increasingly sophisticated overlay of LNG-specific technical provisions. This hybrid character creates conditions conducive to the emergence of contractual gaps whenever the regulatory environment undergoes structural change as has occurred with the introduction of the EEXI and CII frameworks because neither the classical allocation logic nor the existing technical provisions were designed with those requirements in mind.

### 3.2. The IMO Emission Regime and Its Implications for LNG Shipping

The contemporary emission regulatory regime applicable to international shipping is anchored in MARPOL Annex VI as amended by IMO Resolution MEPC.328(76), which introduced the EEXI and CII frameworks effective from 1 January 2023 (International Maritime Organization, 2022). These two instruments operate on complementary planes: the EEXI addresses the technical energy efficiency of the vessel at the design and machinery level, establishing a minimum required standard that must be met through technical modifications where a vessel's existing attained EEXI exceeds the required threshold; the CII, by contrast, addresses the operational carbon intensity of the vessel, generating an

annual A-to-E rating based on the ratio of the vessel's CO<sub>2</sub>-equivalent emissions to its transport work measured in deadweight-tonne-nautical-miles.

From the perspective of LNG shipping, the practical interaction between these two instruments produces operational constraints that have no clear resolution under existing charter party frameworks. Studies assessing the impact of EEXI and CII on different vessel types have found that LNG carriers, while generally better positioned than heavy-fuel-oil-dependent vessels due to the lower carbon factor of LNG combustion, nonetheless face compliance challenges particularly as the required CII rating tightens annually by approximately 2% through 2026 and is subject to further revision thereafter (Bayraktar & Yuksel, 2023). Moreover, the CII regime's sensitivity to vessel speed creates a direct and commercially significant tension: reductions in speed improve the CII rating by reducing fuel consumption per unit time, but they simultaneously reduce cargo delivery rate, potentially triggering contractual disputes with charterers who have issued speed instructions or who bear financial exposure to delays in cargo delivery.

The economic implications of the CII regime extend beyond individual voyage performance to affect the long-term asset value of LNG carriers. Research by Lu and Theocharis has demonstrated a statistically significant correlation between a vessel's energy efficiency and carbon intensity indicators and its second-hand market value, with vessels exhibiting superior emission performance commanding a measurable valuation premium (Lu & Theocharis, 2025). In the chartering context, this finding carries significant legal implications: if a charterer's voyage instructions contribute to a deterioration in a vessel's CII rating, and that deterioration results in a quantifiable reduction in the owner's ability to re-let the vessel at competitive rates, a plausible argument arises that the charterer bears an indemnity obligation though the causal chain required to establish such a claim would be legally complex and factually contested.

Beyond CO<sub>2</sub>-intensity compliance, the LNG-specific dimension of the IMO emission regime raises a further and currently underregulated challenge: the management and attribution of methane emissions. LNG carriers generate methane emissions through two principal pathways. The first is boil-off gas (BOG) arising from heat ingress into the cryogenic cargo tanks during transit; BOG is typically utilised as propulsion fuel, but in excess quantities may be vented or combusted in gas combustion units, generating methane and CO<sub>2</sub> emissions respectively. The second pathway is methane slip uncombusted methane passing through the engine cycle into the exhaust stream which is particularly associated with low-pressure dual-fuel (LPDF) propulsion systems that are prevalent on modern LNG carriers (Herdzik, 2018). Empirical measurements have found methane slip to be substantially higher than previously assumed in regulatory models, with one landmark study reporting average methane slip of 3.8% across all engines measured during a round-trip LNG carrier voyage (Balcombe et al., 2019). These emissions are not currently captured within the CII's CO<sub>2</sub>-equivalent calculation framework, meaning that LNG carriers may present a more favourable CII profile than their actual global warming contribution warrants when methane's higher short-term global warming potential is taken into account.

The regulatory gap regarding methane in the IMO framework represents both a scientific and a legal challenge. At the scientific level, the variability of methane slip across carrier technologies, engine loads, and voyage modes makes standardised accounting difficult (Rosselot et al., 2023). At the legal level, the absence of an explicit methane emission accounting framework within the current EEXI/CII regime means that no clear basis exists within either international maritime law or existing charter party instruments for allocating responsibility for methane emission reduction between owners and charterers. This regulatory silence, compounded by the contractual silence in existing LNG charter party forms, constitutes a second and distinct dimension of the contractual gap identified in this study.

### 3.3. Contractual Gap Analysis: Identifying the Normative Lacunae

The concept of contractual gap, as employed in this study, refers to the condition in which the normative content of an existing contractual instrument is insufficient to resolve a class of legal questions that has arisen as a consequence of changes in the applicable regulatory environment. In the context of LNG charter parties and the IMO decarbonisation regime, this gap manifests across four analytically distinct dimensions, each of which generates independent legal uncertainty and dispute risk.

#### 3.3.1. The CII Responsibility Gap

BIMCO has developed both the CII Operations Clause for Time Charter Parties 2022 and the CII Clause for Voyage Charter Parties 2023 as instruments intended to provide charter parties with a framework for addressing CII compliance obligations. These clauses represent an important development in that they explicitly acknowledge the CII regime and create a cooperative framework for owners and charterers to manage compliance (Bimco, 2022). However, a critical analysis of these instruments reveals that they operate at a level of generality that falls short of the specificity required in the LNG context.

The CII Operations Clause for Time Charter Parties 2022 establishes a framework of shared responsibility, requiring charterers to provide voyage instructions that take into account the vessel's CII obligations and requiring owners to ensure the vessel is technically capable of meeting the applicable standard. The clause permits the owner or master to adjust course or reduce speed where reasonably necessary for CII compliance, without such adjustments constituting a breach of the charter party's performance warranties. The CII Clause for Voyage Charter Parties 2023 follows a structurally similar approach, adapted to the more limited operational control that voyage charterers typically exercise once a fixture has been agreed. While these instruments represent a genuine advance over the complete absence of any CII-related provision in older charter party forms, they remain insufficiently tailored to the LNG context in two important respects.

First, neither clause specifically addresses the manner in which BOG management and methane slip factor into the CII calculation for LNG carriers. The use of BOG as propulsion fuel affects the vessel's reported fuel consumption profile and, consequently, its CII rating, yet no provision in either clause specifies which party bears the obligation to manage BOG consumption in a manner consistent with CII compliance, or how the costs of reliquefaction technology which reduces BOG losses and therefore methane emissions are to be allocated (Kochunni & Chowdhury, 2020). Second, the industry uptake of the BIMCO CII clauses has been reported as lower than anticipated, with major charterers characterising the clause as placing CII obligations disproportionately on charterers; this commercial resistance reduces the practical normative effect of the clauses even where they are incorporated into charter agreements.

#### 3.3.2. The Speed–Emission Conflict

The conflict between contractual speed obligations and the operational adjustments required for CII compliance represents the most immediately commercially significant dimension of the contractual gap. In conventional time and voyage charter parties, the owner warrants that the vessel will perform at a specified speed and fuel consumption under agreed sea conditions; the charterer, in turn, has an economic interest in voyage speed as it directly affects the commercial value of the charter (Hua et al., 2024). Speed reduction is, however, the most practically accessible and operationally immediate lever available for improving a vessel's CII rating, as the relationship between speed and fuel consumption and therefore emissions per transport work unit follows an approximately cubic function: small reductions in speed produce proportionately larger reductions in fuel consumption and emissions.

The BIMCO CII clauses have attempted to address this conflict by providing that speed adjustments for CII compliance do not constitute a breach of the owner's performance warranties or the obligation of due despatch. However, several legal ambiguities remain unresolved (Psaraftis & Kontovas, 2013). The scope of the owner's discretion to reduce speed unilaterally for CII purposes, in the face of charterer instructions to proceed

at a higher speed, is not clearly defined. The legal standard of "reasonably necessary" employed in the BIMCO clause creates interpretive uncertainty as to the threshold at which speed reduction becomes legally justified vis-à-vis the charterer's employment instructions. Furthermore, where speed reduction is implemented by the owner in the absence of an agreed CII clause, the legal position is particularly unclear: absent such a clause, an owner who reduces speed contrary to charterer instructions risks being found in breach of the charter party, while a charterer who instructs a speed that causes the vessel to receive an adverse CII rating may face an indemnity claim that is legally plausible but evidentially difficult to establish.

In the specific LNG context, this conflict is compounded by the BOG management variable: operating at lower speeds affects the vessel's BOG generation rate and utilisation profile, potentially altering the methane emission balance in ways that interact with, but are not captured by, the CII framework as currently constituted.

### 3.3.3. The Methane Emission Governance Gap

The third dimension of the contractual gap concerns the complete absence of specific methane emission governance from existing LNG charter party instruments. As detailed in Section 3.2, methane emissions from LNG carriers arise through BOG management and methane slip, and their climate significance substantially exceeds their representation in current regulatory metrics (Balcombe et al., 2019). From a legal standpoint, the absence of any charter party provision addressing methane emission responsibility creates a situation in which neither party is contractually bound to take specific measures to reduce methane emissions, nor is there a basis for attributing responsibility and associated costs when methane emissions occur.

Technologies such as BOG reliquefaction systems are capable of substantially reducing methane losses during transit, but their installation and operation generate additional capital and operating costs that must be borne by one of the parties (Kochunni & Chowdhury, 2020). In the absence of explicit charter party provisions, the question of which party bears these costs and conversely, which party benefits from the improved emission profile is unresolved. The owner, as the party responsible for the vessel's technical condition and equipment, bears the primary obligation to install and maintain reliquefaction systems where fitted; however, the charterer's benefit from lower fuel consumption and improved emission performance suggests that an equitable allocation would require some sharing of both costs and benefits.

### 3.3.4. The Legal Consequences of the Contractual Gap

The three dimensions of the contractual gap identified above collectively produce three categories of adverse legal consequence for parties to LNG charter agreements in the current regulatory environment.

The first consequence is legal uncertainty. In the absence of explicit contractual provisions allocating emission compliance responsibilities, the parties to an LNG charter party are left to rely on the general principles of maritime contract law: the implied duty to cooperate, the principle of good faith in performance, and the contractual allocation of seaworthiness and commercial risk to resolve disputes that these principles were not designed to address (Boviatsis, 2023). Legal certainty, which is a foundational requirement for an instrument that must facilitate the efficient commercial planning of LNG cargo movements across international trading routes, is correspondingly undermined.

The second consequence is an elevated risk of contractual disputes. The intersection of CII compliance obligations, speed instructions, and methane emission management creates multiple potential flashpoints for disagreement between owners and charterers, particularly where the parties have not incorporated BIMCO's CII clauses and are operating under legacy charter party forms (Jeong & Yun, 2025). The commercially significant consequences of adverse CII ratings including restrictions on port access, reputational damage, and reduced re-let value create strong economic incentives for owners to pursue dispute resolution mechanisms when charterer instructions are perceived to have contributed to compliance failures.

The third consequence is the risk of regulatory non-compliance. Where the contractual ambiguity surrounding emission responsibility causes both parties to default to inaction each relying on the other to bear the cost of compliance the vessel may fail to meet its EEXI technical requirements or accumulate an adverse CII rating that triggers mandatory corrective action obligations under MARPOL Annex VI. This risk is particularly acute for LNG carriers operating in trading patterns that are inherently disadvantageous to CII performance, such as short-haul routes with frequent port calls and high ballast voyage ratios.

### 3.4. Reconstructed Charter Party Clauses for LNG Emission Compliance

The normative analysis presented in Sections 3.1 through 3.3 establishes that the existing charter party framework for LNG shipping requires reconstruction across four specific dimensions: the allocation of emission responsibility, CII compliance obligations, the resolution of the speed–emission conflict, and the governance of methane emissions. The clause models proposed below are grounded in the principle of control-based risk allocation the proposition that legal responsibility for a given emission or compliance outcome should be borne by the party that exercises predominant operational or technical control over the factors generating that outcome supplemented, where causation is shared, by a causation-based cost allocation approach. These principles are consistent with established norms of maritime contract law and with the economic rationale for contractual risk allocation in complex commercial relationships (Plomaritou & Voudouris, 2019).

#### 3.4.1. Emission Responsibility Clause

The Emission Responsibility Clause is designed to establish a clear, normatively grounded allocation of general greenhouse gas emission responsibility between the parties. Its function is foundational: it establishes the conceptual architecture upon which the more specific clauses that follow operate. The following formulation is proposed:

*"The Owners and Charterers shall each bear responsibility for greenhouse gas emissions arising during the Charter Period in proportion to their respective operational control over the activities generating such emissions. The Owners shall be responsible for emissions attributable to the technical condition of the Vessel, installed equipment, and propulsion system performance. The Charterers shall be responsible for emissions attributable to voyage instructions, speed orders, route selection, port call decisions, and cargo operations under their direction. Where emissions arise from activities subject to the joint direction of the parties, the costs of compliance and any penalties arising therefrom shall be allocated by mutual agreement or, in the absence of such agreement, in proportion to each party's contribution to the activity causing such emissions."*

This formulation operationalises the control-based liability principle by distinguishing the technical and operational spheres of responsibility in a manner that reflects the actual structure of authority in LNG charter party relationships. The reference to joint direction provides a residual mechanism for cases in which the allocation of causation is genuinely shared, avoiding the binary rigidity of an owner/charterer dichotomy in circumstances that may not admit of clean division (Ammar et al., 2023).

#### 3.4.2. CII Compliance Clause

The CII Compliance Clause addresses the specific obligations of the parties in relation to the vessel's Carbon Intensity Indicator rating. It builds upon the framework established by the BIMCO CII clauses while adding the LNG-specific provisions that those instruments currently lack:

*"The Charterers shall provide voyage instructions, including speed orders and route directions, that are consistent with the Vessel maintaining a CII rating of at least 'C' as required under applicable IMO regulations for the relevant calendar year. The Owners shall ensure that the Vessel is technically maintained and equipped to achieve the required CII rating under commercially reasonable operating conditions, including, where applicable, through the proper functioning of reliquefaction systems and BOG management equipment. In the event that compliance with applicable CII requirements necessitates operational adjustments, including reductions in speed, alterations to route, or modifications to BOG utilisation procedures, such measures shall not constitute*

*a breach of any performance warranty, speed warranty, or obligation of due despatch under this Charterparty, provided that the party implementing such adjustments acts in good faith, takes reasonable steps to minimise commercial disruption, and notifies the other party promptly. The Owners and Charterers shall exchange relevant operational data, including fuel consumption records, CII rating projections, and BOG management records, at monthly intervals or such other period as the parties may agree."*

The requirement for monthly data exchange serves a preventive function: by ensuring that both parties have visibility of the vessel's CII trajectory throughout the year, it facilitates early identification of compliance risks and allows for collaborative corrective action before an adverse rating is recorded. This cooperative mechanism aligns with the data-sharing provisions included in the BIMCO CII clauses, whilst extending their scope to encompass the LNG-specific BOG management dimension (Bimco, 2022).

### 3.4.3. Speed–Emission Adjustment Clause

The Speed–Emission Adjustment Clause is specifically designed to resolve the legal ambiguity surrounding the owner's entitlement to reduce vessel speed for CII compliance purposes. It operates as a *lex specialis* relative to any general speed and performance warranty in the charter party:

*"Notwithstanding any agreed speed, consumption, or performance warranty contained in this Charterparty, the Owners shall be entitled to instruct the Master to reduce the Vessel's speed or adjust engine output where reasonably necessary to maintain or improve the Vessel's CII rating in compliance with applicable IMO regulations. Such reductions in speed shall not constitute a breach of any performance warranty or of the Owners' obligations to proceed with due or utmost despatch. Where a speed reduction is implemented pursuant to this Clause, the Owners shall: (i) notify the Charterers without unreasonable delay, specifying the basis for the reduction and the anticipated duration; (ii) take all reasonably practicable steps to minimise the commercial impact on the Charterers' operations; and (iii) restore full operational speed as soon as the CII compliance basis for the reduction is no longer applicable. Where the Charterers dispute the necessity of a speed reduction implemented pursuant to this Clause, the matter shall be referred to expert determination by a mutually agreed maritime and emissions expert within [14] days of written notification of the dispute."*

The inclusion of an expert determination mechanism for speed disputes is designed to provide a rapid, cost-effective resolution pathway that avoids the delay and expense of arbitration or litigation for what may be operationally time-sensitive disagreements. The requirement for the owner to restore full speed once the CII compliance basis is no longer applicable is intended to prevent abuse of the clause as a mechanism for reducing operating costs under the guise of emission compliance—a risk that charterers may legitimately raise in the course of negotiations (Psaraftis & Kontovas, 2013).

### 3.4.4. Methane Emission Clause (LNG-Specific)

The Methane Emission Clause represents the most novel element of the proposed reconstructed charter party framework. No existing standard-form LNG charter party instrument contains an explicit methane emission governance provision, despite the scientific evidence establishing that methane emissions through both BOG mismanagement and engine slip constitute a material component of the total greenhouse gas intensity of LNG shipping operations (Balcombe et al., 2019). The following formulation is proposed as a starting point for industry negotiation:

*"(a) The parties acknowledge that greenhouse gas emissions arising from LNG cargo operations, boil-off gas management, and propulsion system combustion may include methane emissions of climate significance beyond those captured in the Vessel's CII calculation under current IMO regulations. (b) The Owners shall implement all technically and commercially reasonable measures to minimise methane emissions arising from the Vessel's operations, including: (i) the proper operation and maintenance of any installed reliquefaction system; (ii) the optimal utilisation of boil-off gas as propulsion fuel; and (iii) the use of engine management techniques designed to reduce methane slip from dual-fuel propulsion systems. (c) The Charterers shall not give voyage or operational instructions that would require the Vessel to operate in a manner that, to the Owners' reasonable knowledge, would unnecessarily increase methane emissions beyond levels achievable*

*under normal LNG carrier operations. (d) Costs associated with the installation or upgrade of methane emission mitigation equipment shall be borne by the Owners. Costs associated with reliquefaction operations or BOG utilisation measures undertaken at the direction of or for the benefit of the Charterers shall be shared between the parties in proportions to be agreed in Box [X] or, in the absence of agreement, on an equal basis. (e) The parties agree to cooperate in good faith in any future regulatory development that imposes methane-specific obligations on LNG carriers and to negotiate in good faith to amend this Charterparty accordingly."*

The causation-based cost allocation in sub-clause (d) reflects the recognition that methane emission mitigation in the LNG context involves costs and benefits that accrue to both parties: the owner benefits from the reputational and regulatory risk reduction associated with lower methane emissions, while the charterer benefits from the reduced fuel consumption that BOG utilisation and reliquefaction improvements can deliver (Kochunni & Chowdhury, 2020). The good faith negotiation obligation in sub-clause (e) is designed to ensure that the charter party remains capable of adapting to future regulatory developments including potential revisions to the IMO's CII framework that may incorporate methane emissions without requiring formal renegotiation of the instrument as a whole.

### 3.5. Synthesis: The Charter Party as an Instrument of Environmental Compliance

The foregoing analysis and the proposed clause reconstructions collectively reflect a broader normative proposition: that the LNG charter party, in the post-2023 regulatory environment, cannot function adequately as a purely commercial instrument. The introduction of mandatory emission compliance obligations binding in international law and administratively consequential for the vessel's continued commercial operability has altered the normative environment within which charter parties operate, in the same manner that the introduction of the ISM Code in the 1990s altered the safety management obligations that charter parties must accommodate.

The reconstruction of LNG charter party clauses in the manner proposed in this study is intended to achieve three objectives simultaneously. First, it provides legal certainty by establishing explicit and predictable rules for the allocation of emission compliance responsibilities, reducing the scope for dispute and enabling the parties to plan their commercial operations with confidence. Second, it aligns the private contractual framework with the public international law obligations imposed by the IMO's decarbonisation regime, ensuring that the charter party functions as an instrument of regulatory compliance as well as commercial ordering. Third, it introduces equity into the distribution of the costs and benefits of emission compliance, by applying allocation principles control-based liability and causation-based cost sharing that reflect the actual structure of authority and interest in LNG charter party relationships.

It is recognised that the adoption of these reconstructed clauses will require industry-wide acceptance, which in practice means engagement by BIMCO and GIIGNL in the revision of the LNGVOY and related time charter instruments. The history of LNG charter party development from the early adaptations of Shelltime 4 through the development of ShellLNGTime to the creation of LNGVOY demonstrates that the industry is capable of producing standardised instruments that respond to evolving commercial and regulatory requirements (BIMCO & GIIGNL, 2016). The present study provides the normative and analytical groundwork for such an exercise by demonstrating the specific dimensions of the gap that must be addressed and proposing formulations that balance the legitimate interests of owners, charterers, and the international community in reducing the greenhouse gas intensity of global LNG transportation.

## 4. Conclusions

The study demonstrates that a fundamental structural misalignment exists between existing LNG charter party frameworks and the emission compliance obligations introduced under the IMO's decarbonisation regime, particularly through MARPOL Annex VI amendments mandating EEXI and CII from January 2023. This misalignment is not merely

technical but reflects a deeper incompatibility between traditional contractual risk allocation and contemporary regulatory demands requiring measurable emission accountability. Four principal contractual gaps were identified: the absence of explicit CII responsibility allocation, unresolved tensions between contractual speed warranties and emission-driven operational adjustments, the lack of methane emission governance in LNG-specific operations, and the resulting legal uncertainty, dispute risk, and exposure to regulatory non-compliance. Collectively, these deficiencies undermine the effectiveness of LNG charter parties as instruments capable of supporting compliance within a carbon-constrained shipping environment.

In response, this study proposes a reconstructed contractual model based on control-based liability and causation-based cost allocation, comprising four integrated clauses addressing emission responsibility, CII compliance, speed–emission alignment, and methane regulation. Beyond resolving discrete contractual ambiguities, this reconstruction reframes the LNG charter party as a dual-function instrument that integrates commercial governance with environmental compliance. Such evolution is necessary to ensure legal certainty, reduce dispute potential, and align private contractual arrangements with public regulatory objectives. Accordingly, the adaptation of LNG charter party structures is not optional but essential for maintaining the sector’s operational viability and legitimacy within the global decarbonisation agenda.

This study demonstrates that a fundamental structural misalignment persists between existing LNG charter party frameworks and the emission compliance obligations introduced under the IMO’s decarbonisation regime, particularly through MARPOL Annex VI amendments mandating EEXI and CII from January 2023. This misalignment reflects not only technical incompatibility but also a deeper disconnect between traditional contractual risk allocation and emerging regulatory demands requiring measurable emission accountability. Four principal contractual gaps were identified: the absence of explicit CII responsibility allocation, unresolved tensions between contractual speed warranties and emission-driven operational adjustments, the lack of methane emission governance in LNG-specific operations, and the resulting legal uncertainty, dispute risk, and exposure to regulatory non-compliance, all of which undermine the effectiveness of LNG charter parties as instruments of compliance in a carbon-constrained shipping environment. In response, this study proposes a reconstructed contractual model grounded in control-based liability and causation-based cost allocation, comprising four integrated clauses addressing emission responsibility, CII compliance, speed–emission alignment, and methane regulation, thereby reframing LNG charter parties as dual-function instruments that integrate commercial governance with environmental compliance. These findings highlight the need for institutional actors, including the International Maritime Organization, the Baltic and International Maritime Council, and the International Group of Liquefied Natural Gas Importers, to accelerate the standardisation of LNG-specific emission clauses, while also underscoring the importance of future research incorporating empirical and interdisciplinary approaches to assess operational and economic impacts, including the evolving regulatory treatment of methane emissions. Ultimately, the continued adaptation of LNG charter party structures is essential to ensure regulatory compliance, legal certainty, and the long-term sustainability of maritime transport within the global decarbonisation agenda.

## References

- Ammar, N. R., Almas, M., & Nahas, Q. (2023). Economic Analysis and the EEXI Reduction Potential of Parallel Hybrid Dual-Fuel Engine–Fuel Cell Propulsion Systems for LNG Carriers. *Polish Maritime Research*, 30(3), 59–70. <https://doi.org/10.2478/pomr-2023-0039>
- Arican, O. H., Toprakçı, O., Ünal, A. U., & Özbağ, G. K. (2025). Analyzing Carbon Regulation Impacts on Maritime Sector Using Fuzzy Delphi–DEMATEL–ISM Approach. *Systems*, 13(11). <https://doi.org/10.3390/SYSTEMS13110955>
- Bach, H., & Hansen, T. (2023). IMO off course for decarbonisation of shipping? Three challenges for stricter policy. *Marine Policy*, 147,

105379. <https://doi.org/10.1016/j.marpol.2022.105379>
- Balcombe, P., Brierley, J., Lewis, C., Skatvedt, L., Speirs, J., Hawkes, A., & Staffell, I. (2019). How to decarbonise international shipping: Options for fuels, technologies and policies. *Energy Conversion and Management*, 182, 72–88. <https://doi.org/10.1016/j.enconman.2018.12.080>
- Bayraktar, M., & Yuksel, O. (2023). A scenario-based assessment of the energy efficiency existing ship index (EEXI) and carbon intensity indicator (CII) regulations. *Ocean Engineering*, 278, 114295. <https://doi.org/10.1016/j.oceaneng.2023.114295>
- Bhat, P. I. (2020). Doctrinal Legal Research as a Means of Synthesizing Facts, Thoughts, and Legal Principles. In *Idea and Methods of Legal Research* (pp. 143–168). Oxford University Press Delhi. <https://doi.org/10.1093/oso/9780199493098.003.0005>
- Bimco. (2022). Cii Operations Clause For Time Charter Parties 2022. *Baltic And International Maritime Council*.
- BIMCO. (2021). *LNG Fuel Gas-freeing and Cool-down Clause*. <https://www.bimco.org/contractual-affairs/bimco-clauses/current-clauses/lng-fuel-gas-freeing-and-cool-down-clause/>
- BIMCO, & GIIGNL. (2016). *LNGVOY explanatory notes*. Baltic and International Maritime Council. <https://www.bimco.org/contractual-affairs/bimco-contracts/contracts/lngvoy/>
- Boviatsis, M. (2023). Comparative analysis of charter party clauses versus marine insurance contractual terms: present legal status and future trends. *WMU Journal of Maritime Affairs*, 22(1), 91–106. <https://doi.org/10.1007/s13437-022-00292-0>
- Herdzik, J. (2018). Methane Slip During Cargo Operations on LNG Carriers and LNG-Fueled Vessels. *New Trends in Production Engineering*, 1(1), 293–299. <https://doi.org/10.2478/ntpe-2018-0036>
- Hua, R., Yin, J., Wang, S., Han, Y., & Wang, X. (2024). Speed optimization for maximizing the ship's economic benefits considering the Carbon Intensity Indicator (CII). *Ocean Engineering*, 293, 116712. <https://doi.org/10.1016/J.OCEANENG.2024.116712>
- Hutchinson, T. (2015). The Doctrinal Method: Incorporating Interdisciplinary Methods in Reforming the Law. *Erasmus Law Review*, 8(3), 130–138. <https://doi.org/10.5553/ELR.000055>
- International Maritime Organization. (2008). *Index of MEPC Resolutions and Guidelines related to MARPOL Annex VI*. <https://www.imo.org/en/ourwork/environment/pages/index-of-mepc-resolutions-and-guidelines-related-to-marpol-annex-vi.aspx>
- International Maritime Organization. (2022). *EEXI and CII - ship carbon intensity and rating system*. <https://www.imo.org/en/mediacentre/hottopics/pages/eexi-cii-faq.aspx>
- International Maritime Organization. (2023). *2023 IMO Strategy on Reduction of GHG Emissions from Ships*. <https://www.imo.org/en/ourwork/environment/pages/2023-imo-strategy-on-reduction-of-ghg-emissions-from-ships.aspx>
- Jeong, H., & Yun, H. (2025). On analysing key drivers of carbon emissions in maritime transport with focus on carbon intensity indicators. *Maritime Economics and Logistics*, 27(4), 607–627. <https://doi.org/10.1057/S41278-024-00310-3>
- Kochunni, S. K., & Chowdhury, K. (2020). Zero methane loss in reliquefaction of boil-off gas in liquefied natural gas carrier ships by using packed bed distillation in reverse Brayton system. *Journal of Cleaner Production*, 260, 121037. <https://doi.org/10.1016/j.jclepro.2020.121037>
- Lehtoranta, K., Kuittinen, N., Vesala, H., & Koponen, P. (2023). Methane Emissions from a State-of-the-Art LNG-Powered Vessel. *Atmosphere*, 14(5), 825. <https://doi.org/10.3390/atmos14050825>
- Lu, P. H., & Theocharis, D. (2025). The influence of energy efficiency and carbon indicators on ship prices: early evidence from the tanker and bulk carrier sectors. *Maritime Economics and Logistics*, 27(3), 549–566. <https://doi.org/10.1057/S41278-025-00316-5>
- Plomaritou, E., & Voudouris, Y. (2019). The Relationships of Bill of Lading, Charterparty and Other Transport Documents. *Journal of Economics, Management and Trade*, 1–8. <https://doi.org/10.9734/jemt/2019/v24i630182>
- Psaraftis, H. N., & Kontovas, C. A. (2013). Speed Models for Energy-Efficient Maritime Transportation: A Taxonomy and Survey. *Transportation Research Part C: Emerging Technologies*, 26, 331–351. <https://doi.org/10.1016/j.trc.2012.09.012>
- Rosselot, K. S., Balcombe, P., Ravikumar, A. P., & Allen, D. T. (2023). Simulating the Variability of Methane and CO2 Emissions from Liquefied Natural Gas Shipping: A Time-in-Mode and Carrier Technology Approach. *ACS Sustainable Chemistry & Engineering*, 11(43), 15632–15643. <https://doi.org/10.1021/ACSSUSCHEMENG.3C04269>

- Schofield, J. (2021). Laytime and Demurrage. *Laytime and Demurrage*, 1–619. <https://doi.org/10.4324/9781003198406/LAYTIME-DEMURRAGE-JOHN-SCHOFIELD/RIGHTS-AND-PERMISSIONS>
- Tadros, M., Ventura, M., & Guedes Soares, C. (2024). Review of the IMO Initiatives for Ship Energy Efficiency and Their Implications. *Journal of Marine Science and Application* 2023 22:4, 22(4), 662–680. <https://doi.org/10.1007/S11804-023-00374-2>
- Wu, W., Zhou, K., & Lin, C. (2025). The international legal and practical development of shipping decarbonization: China's perspective. *Frontiers in Marine Science*, 12. <https://doi.org/10.3389/FMARS.2025.1689866>