



CHALLENGES OF HYDROGEN IN SHIPPING: INNOVATION VS LIABILITY

Navigating risks and advancements in maritime hydrogen energy

BETWEEN
INNOVATION AND
SAFETY:
OPPORTUNITIES AND
RISKS

INNOVATION VS. LIABILITY REGIMES

Innovation vs. Legal Adaptation

Risk and Liability Landscape

Strategic Risk Management

Future Regulatory Influence



TAKEAWAYS

Hydrogen as Decarbonisation Fuel

Liability Regime Gap

Regulatory and Claims Framework

Managing Near-term Risk

Future Regulatory Engagement

WHY HYDROGEN MATTERS: DECARBONISATION AND FIRST-MOVER ADVANTAGE

Hydrogen's Role in Decarbonisation

Hydrogen can significantly reduce or eliminate CO₂ emissions, supporting deep decarbonisation in shipping.

First-Mover Competitive Advantages

Early hydrogen adoption enables to optimize routes, collaborate with ports, and reduce operational risks.

Emerging Risks and Challenges

Limited experience with hydrogen handling creates risks in safety, supply chains, and emergency response.

Legal and Regulatory Considerations

Strong safety governance and legal risk management reduce litigation exposure and support compliance.



HYDROGEN HAZARD PROFILE: FIRE, EXPLOSION, AND ASPHYXIATION



Primary Hydrogen Hazards

Limited Maritime Experience

Liability and Risk Management

Operational and Legal Readiness

THE CORE LEGAL PROBLEM



- Innovation Outpacing Liability
 - Hydrogen fuel innovation advances faster than international liability regimes addressing related risks.
- Liability Framework Gaps
 - Absence of strict international liability for hydrogen risks leads to inconsistent legal outcomes globally.
- Consequences for Stakeholders
 - Lack of uniform rules complicates compensation for victims and increases litigation for operators.
 - Challenges in contract governance
 - Contract liability (?)
 - Insurance (?)
 - Financial exposure (?)
- Strategic Response
 - Use current frameworks short-term and engage in policy for future fair regulations.

CURRENT LEGAL LANDSCAPE

TRADITIONAL FUELS VS HYDROGEN: LIABILITY CONTRAST

Mature Liability Regimes

Conventional marine fuels benefit from strict liability conventions and robust insurance mechanisms ensuring compensation.

Hydrogen Legal Variability

Hydrogen incidents lack a standardized strict liability framework and rely on national laws and general limitation regimes.

Operational and Reputational Impact

Need to manage multi-jurisdictional claims and demonstrate safety while fostering stakeholder trust amid innovation.

Insurance and Risk Allocation

With no tailored convention, insurance terms and contractual risk allocations with suppliers become critical for compensation.



ALTERNATIVE FUELS ANALOGY: LESSONS FROM BIOFUELS AND BLENDS



Legal Grey Zones in Alternative Fuels

Biofuels create legal ambiguity as pure biofuels exclude mineral oils, but blends may fall under existing regulations causing uncertainty.

Challenges of Definitional Uncertainty

Stakeholders disagree on convention applicability, leading to non-uniform legal outcomes and increased litigation risks in new fuel regimes.

Compensation and Liability Gaps

When international conventions do not apply, compensation depends on varied national laws and private insurance, creating risks for claimants.

Strategic Approach for Hydrogen Transition

A measured approach with interim guidance and voluntary best practices supports innovation and legal clarity during the fuel transition period.



WHAT APPLIES TODAY: NATIONAL LAW, LLMC 1996, AND WRECK REMOVAL

Jurisdictional Liability Variations

Liability depends on the law and jurisdiction where incidents occur, affecting standards and litigation strategies.

LLMC 1996 Limitation Framework

The LLMC 1996 provides key international limitation rules for loss of life, injury, property damage, and pollution claims.

Nairobi Wreck Removal Convention

This convention imposes strict liability for wreck removal, but only applies to wreck scenarios, not general incidents.



WHAT DOES NOT APPLY: BUNKERS CONVENTION, CLC, AND HNS LIMITATIONS

Exclusions of Bunkers and CLC

The Bunkers and CLC Conventions exclude hydrogen because they apply only to hydrocarbon mineral oils, limiting their legal reach.

HNS Convention Status

The HNS Convention is not yet in force, making it currently inoperative for hydrogen fuel liability coverage.

Strategic Implications

Diverse national claims increasing legal complexity.

Future Policy Outlook

Policy discussions aim to close coverage gaps by extending conventions or creating new regimes for alternative fuels.



THE LIABILITY GAP: FRAGMENTATION, UNCERTAINTY, AND LITIGATION COMPLEXITY

Liability Fragmentation

Lack of a global hydrogen liability regime causes fragmented legal standards and inconsistent compensation rules worldwide.

Management Levers

Operational safety, contractual agreements, and aligned insurance policies are key to managing liability risks effectively.

Policy and Innovation

Policy momentum aims to unify liability regimes to balance victim protection with innovation encouragement in hydrogen technologies.

Transaction Costs and Litigation

Fragmentation increases litigation complexity, leading to higher costs, multiple proceedings, and uncertainty in settlements.

LIMITATION OF LIABILITY



POTENTIAL CLAIMS FROM HYDROGEN INCIDENTS: A PRACTICAL MAP

Categories of Claims

Hydrogen incidents can lead to claims including personal injury, property damage, cleanup costs, and economic loss.

Incident Pathways

Fires, explosions, asphyxiation, and releases can cause various damages triggering multiple claim types.

Jurisdictional Risks

Different legal jurisdictions may award different damages for similar incidents, increasing operational risks.

Proactive Exposure Management

Claim mapping guides contract clauses, insurance needs, emergency response, and evidence preservation for Shipping companies

LLMC 1996: THE CENTRAL PROTECTIVE PILLAR FOR SHIPOWNERS



LLMC 1996 as Liability Framework

LLMC 1996 provides a default international regime limiting shipowner liability for key maritime claims including injury and property damage.

Relevance for Hydrogen Shipping

Specialized pollution conventions do not cover hydrogen; LLMC 1996 serves as main limitation regime in these cases.

Conditions and Limits of Limitation

Limitation depends on jurisdiction participation and procedural steps; high fault threshold exists to break limitation.

Strategic Importance for Samskip

LLMC enables predictable liability caps aiding investment, contracts, insurance, and supports strong operational governance.



LLMC LIMITS IN PRACTICE: STRUCTURE, SDR BASIS, AND PREDICTABILITY

LLMC Structure and SDR Basis

Limitation amounts combine base sums and tonnage increments for personal injury and property claims.

Predictability in Risk Planning

Limitation framework caps liability exposure, allowing to estimate risk ex ante for hydrogen projects.

Operational and Reputational Considerations

Limitation does not negate potential downtime, regulatory impacts, or stakeholder scrutiny after incidents.

Behavioral Compliance and Claims Strategy

Preserving limitation depends on compliant operations and structured claims negotiations to reduce litigation.



FRAGMENTATION AND FORUM RISK: WHY LOCATION DETERMINES OUTCOMES

Impact of Fragmentation on Liability

Legal outcomes vary by location due to differing laws on injury, property damage, and economic loss.

Managing Forum Risk Contractually

Contracts include dispute resolution, choice-of-law clauses, and aligned indemnity provisions to reduce risk.

Operational and Insurance Strategies

Standardized incident response and multi-jurisdictional insurance policies ensure compliance and coverage.

Business and Policy Considerations

Incorporating jurisdictional risk into route planning and advocating for international legal clarity.

INSURANCE AS THE PRACTICAL COMPENSATION ENGINE IN A LEGAL GAP

Insurance's Role in Risk Transfer

Insurance acts as a vital tool for compensation and risk transfer amid incomplete hydrogen-specific liability laws.

Underwriting and Stakeholder Engagement

Insurers evaluate hazards, engineering, and safety standards, influencing contractual terms and operational practices.

Claims Management Preparedness

Establishing protocols for incident notification and evidence preservation ensures smooth claims handling and dispute reduction.

Strategic Insurance Planning Benefits

Robust insurance planning complements liability limits, enabling safer innovation and financial certainty for companies.



MITIGATION, MESSAGING, AND FUTURE-PROOFING



A TRANSITIONAL WINDOW WITH MANAGEABLE EXPOSURE

Legal Framework Advantage

Hydrogen marine fuel currently lacks a strict-liability regime, allowing reliance on LLMC 1996 limitation framework.

Strategic Transitional Opportunity

Innovation and scale with predictable liability exposure during this transitional legal period.

Leadership in Safety Governance

Leading safety practices reduce incident risks and strengthen defenses, shaping future hydrogen governance.

Influence on Future Regulations

Opportunity to shape balanced, clear, and workable international hydrogen fuel rules.

RISK MITIGATION PLAYBOOK: ENGINEERING, CONTRACTS, INSURANCE, GOVERNANCE

Engineering Controls

Design hydrogen systems with redundancy, leak detection, ventilation, isolation, and robust materials to reduce risks effectively.

Contractual Risk Allocation

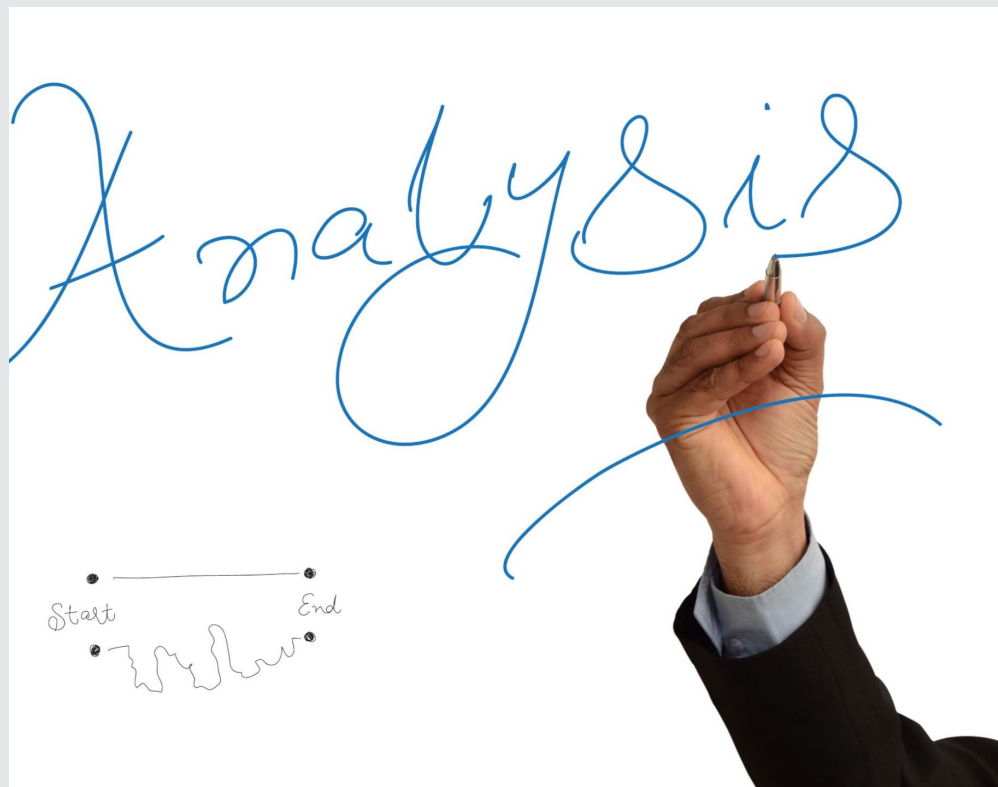
Define clear responsibilities, warranties, and risk allocations in contracts to address fragmented liability in hydrogen operations.

Insurance Coverage

Engage with insurers early to secure coverage for hydrogen-specific perils and ensure counterparties maintain proper insurance.

Governance and Incident Response

Standardize incident planning, evidence preservation, communication, and regulatory coordination to maintain legal defenses.



LOOKING AHEAD

Growing Legal and Political Pressure

Alternative fuels scaling leads to increased pressure for closing compensation gaps and expanding legal coverage categories.

Potential Regulatory Reforms

Future reforms may include strict liability, compulsory insurance, and new damage recognition categories.

Future-Proofing Strategies

Important to build robust systems, early insurer engagement, and proactive stakeholder relationships to meet future requirements.

Policy Engagement Importance

Active participation in policy development ensures risk-based, realistic rules aligned with actual hazard profiles.



KEY TAKEAWAYS



Hydrogen Hazard Management

Hydrogen risks like fire and asphyxiation require robust engineering, training, and strict operational discipline to ensure safety.

Liability Framework Challenges

Current international liability laws lag behind hydrogen innovation, creating legal uncertainty and jurisdictional fragmentation.

Samskip's Strategic Positioning

Samskip adopts an integrated approach combining engineering, contracts, insurance, and policy engagement to lead responsibly.

Balancing Innovation and Safety

Samskip balances pro-innovation efforts with high safety standards to build trust and navigate evolving frameworks.