Insuring Shipping's Transition

Climate, Biodiversity and the Role of Marine Insurance in Decarbonisation



SEAS AT RISK

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Executive Summary

Almost everything we buy, eat or use has, at some point, travelled by ship. Decarbonising that system is one of the less visible but most consequential pieces of the climate transition.

Shipping moves around 90% of global trade and contributes to around 3% of greenhouse gas emissions, roughly the same as major industrialised countries such as Germany or Japan. Meeting international and national climate objectives will require the sector to decarbonise quickly. International and regional decarbonisation efforts increasingly focus on measures such as improving vessel energy efficiency, deploying renewable and wind-assisted propulsion technologies, adopting zero- and near-zero-emission fuels, and operational measures such as speed optimisation.

Yet one potentially powerful market-based lever has received comparatively little attention: marine insurance.

Marine insurance is essential to global shipping. It protects vessels and operators against major losses and liabilities, and in many cases insurance is a practical or legal requirement for ships to trade internationally. That gives insurers an important role in determining what risks are acceptable, on what terms and at what cost. Insurance is compulsory for certain liabilities, including oil pollution, bunker pollution and wreck removal, while financiers, charterers, flag states and other market actors also expect vessels to maintain adequate insurance cover.

This paper sets out practical ways marine insurance can support cleaner shipping, including:

- rewarding ships with lower emissions and better environmental performance through lower insurance premiums;
- reflecting climate and regulatory risks in insurance policies and deductibles;
- requiring greater transparency on emissions and fuel use before offering insurance incentives;
- assessing environmental, social, climate and biodiversity risks as part of the insurance decisions.

This paper argues that marine insurance is an underused market-based lever that can play a more active role in supporting shipping decarbonisation. Unlike international regulatory processes, many marine insurance contracts are renewed on a relatively short cycle. This gives insurers recurring opportunities to reassess risk and adjust premiums, coverage terms or information requirements as conditions evolve. Those signals may be modest individually, but they can become more influential when they reinforce finance, regulation and commercial demand.

Today, marine underwriting remains strongly focused on familiar vessel-level factors such as casualty history, age, condition, flag, class and trading patterns. Climate, transition and biodiversity considerations are less systematically integrated into vessel-level underwriting, particularly where their connection to insured losses is indirect or difficult to quantify.

This can mean that investments in efficiency or low-emission technologies such as wind-assisted propulsion receive little insurance recognition and, in some cases, may face additional scrutiny because insurers lack historical claims data or established methodologies for unfamiliar technologies. The result can be a mismatch between the direction in which the fleet needs to move and some of the financial signals surrounding those investments.

“Marine insurance has long helped protect shipping from financial risk. Now it must help the sector navigate the risks of the climate transition.”

Shipping faces a changing risk environment, including physical climate impacts, regulatory change, evolving fuel and technology risks and growing environmental liabilities. Some transition effects, such as declining asset values or commercial obsolescence, fall most directly on shipowners and lenders. They may nevertheless become relevant to insurers where they affect maintenance, operating behaviour, liability or portfolio exposure.

This also helps explain why banks have moved further than insurers in assessing transition risk. A lender may finance a ship for many years and therefore cares directly about whether that vessel loses value or becomes commercially obsolete. An insurer usually covers defined risks over a much shorter period. The two therefore experience transition risk differently, and insurance approaches cannot simply replicate banking frameworks.

Importantly, decarbonisation technologies can reduce some forms of transition or compliance exposure while introducing new operational risks. Alternative fuels such as ammonia, methanol and hydrogen, for example, may create new safety, machinery and liability considerations that insurers must assess alongside their climate benefits. This is precisely why insurers should be involved in the transition: not to select which technologies should win, but to assess these changing risk trade-offs properly and help ensure new solutions remain safely insurable.

At the same time, advances in emissions monitoring, vessel tracking and data analytics are improving the evidence available to assess vessel performance. Regulatory reporting and evolving climate policies also provide clearer information about the direction of travel, even where implementation remains uncertain. Together, these developments give insurers a stronger basis for testing how climate and biodiversity considerations can be incorporated into underwriting.

The Poseidon Principles have introduced common climate-alignment metrics into shipping finance, while the Poseidon Principles for Marine Insurance apply a related approach to insurers' Hull & Machinery portfolios. Their experience shows both that climate alignment can be incorporated into marine insurance and that voluntary action has limits, particularly where insurers lack access to consistent data or have limited leverage over shipowners. Insurance is therefore likely to be most effective when it works alongside finance, regulation and common data standards.

This evolution would not be unprecedented. Across property, casualty and commercial insurance, insurers are increasingly incorporating climate-related physical and transition risks into underwriting through catastrophe modelling, restrictions on high-risk exposures, disclosure requirements and differentiated pricing. Marine insurance differs from other insurance sectors in important ways, including shorter policy horizons, mutualisation within P&I, compulsory liability cover and the unfamiliar technical risks associated with new fuels and propulsion systems. Approaches developed elsewhere therefore cannot simply be transferred wholesale. They can, however, provide useful methods and experience that marine insurers can adapt to their own market.

Recognising these structural constraints, particularly within mutual P&I Clubs, the paper proposes limited pilot projects to test which climate- and biodiversity-related factors can be translated into credible underwriting criteria, what data is required, and whether insurance incentives can meaningfully influence behaviour in practice without creating competitive disadvantages.





Finally, reliable and comparable emissions and fuel-use data are an important foundation for climate-informed underwriting. Existing sources, including regulatory reporting and validated third-party modelling, can already provide part of this evidence base. Greater consistency, accessibility and interoperability would enable more robust vessel-level and portfolio-level assessment. Regulatory reporting, third-party modelling and direct data-sharing can therefore all contribute to better underwriting decisions.

Marine insurance has long helped protect shipping from financial risk. As climate change, new technologies and environmental regulation reshape those risks, insurers have a commercial interest in adapting the way they assess and price them. Some emerging risks may not yet be fully reflected in traditional underwriting baselines, particularly where historical loss data is a poor guide to future exposure. Integrating climate and biodiversity considerations into underwriting is therefore not simply about supporting decarbonisation. It can improve underwriting accuracy, strengthen portfolio resilience and help insurers anticipate risks that are becoming increasingly material.

Insurance will not decarbonise shipping on its own. But by recognising where cleaner technologies, changing fuels and environmental performance genuinely affect risk, insurers can help reward early action, support more resilient investment decisions and reinforce the signals already coming from regulation, finance and technical standards. Marine insurance should therefore play a more active role in shipping's transition.

Introduction: Marine Insurance as a Climate Lever

The global shipping sector is entering a decisive decade for climate action. As international trade continues to rely heavily on maritime transport and as we are getting closer and closer to a post 2C world, pressure is mounting on the sector to reduce greenhouse gas emissions in line with the objectives of the Paris Agreement and emerging national and regional climate frameworks. Regulatory efforts at the international and regional levels are moving in this direction, but progress remains uneven and in danger, subject to delay, and vulnerable to political compromise. In this context, relying on regulation alone to drive the pace and depth of decarbonisation for the shipping sector would be a fallacy.

Shipping, however, is not governed by regulation in isolation. It is a capital-intensive, risk-sensitive industry in which commercial decisions are continuously shaped by reputation/perception as well as financial and insurance institutions. Among these, marine insurers occupy a uniquely influential position. By determining which vessels can operate, under what conditions, and at what cost, insurers exert a persistent influence over operational behaviour, investment decisions, and technology uptake across the global fleet.

Despite this influence, marine insurance has not yet been systematically mobilised as a tool to support climate and environmental objectives. Current underwriting practices remain overwhelmingly focused on short-term, vessel-specific financial risk, including casualty history, vessel age, class, flag, and trading patterns. While these factors are essential for loss prevention and solvency, they offer an incomplete picture of the risks now confronting the shipping sector. Emissions performance, fuel-related climate risk, biodiversity-related liability and regulatory risks, and long-term transition liabilities are largely absent from underwriting frameworks, even as these risks become increasingly material and urgent.

This disconnect creates a structural misalignment. Vessels that continue to operate on high-emission pathways or rely on fuels with significant upstream climate impacts often face little or no insurance-related penalty, while operators investing in efficiency measures, alternative propulsion, or lower-risk technologies receive limited recognition or sometimes higher premiums or scrutiny such as for the installation of wind assist propulsion system. Vessels that continue to operate on high-emission pathways or rely on fuels with significant upstream climate impacts often face little or no insurance-related penalty, while operators investing in efficiency measures, alternative propulsion or lower-risk technologies may receive limited recognition or, in some cases, face additional scrutiny or higher premiums because insurers lack historical claims data, actuarial experience or standardised methodologies for assessing unfamiliar technologies such as wind-assisted propulsion systems. As a result, insurance markets may inadvertently reinforce business-as-usual practices, slowing the uptake of solutions that are essential for meeting climate targets.

At the same time, the risk landscape facing marine insurers is changing rapidly. Physical climate risks, including extreme weather events, port disruption, and altered sea conditions, are already affecting loss patterns. Transition risks, such as that of stranded assets, are growing as regulatory frameworks tighten, and fuel markets evolve. Liability and reputational risks are also expanding as environmental harm[1], including emissions and biodiversity impacts, comes under greater legal and public scrutiny. These developments suggest that climate and environmental risks are not peripheral concerns but core underwriting issues that will increasingly affect insurers' portfolios.

Marine insurance therefore represents a critical, and currently underutilised, lever for accelerating decarbonisation in shipping. Unlike regulatory processes, which tend to move slowly and episodically,

1 OECD, Climate Change and Long-Term Asset Stranding (2019)

1. Why Current Underwriting Falls Short

Marine insurance underwriting has evolved to manage a well-defined set of risks associated with maritime operations: collisions, groundings, machinery failure, cargo loss, pollution incidents, and crew safety. Over decades, insurers and P&I Clubs have refined methodologies to price these risks with increasing precision, relying on historical loss data, vessel characteristics, trading patterns, and compliance with technical and safety standards. This approach has proven effective in maintaining solvency and supporting the functioning of global trade.

However, the risk landscape facing the shipping sector is changing faster than underwriting practices have adapted. Climate change, environmental degradation, and the global transition toward low-carbon transport introduce categories of risk that are systemic, forward-looking, and increasingly material, yet remain largely unaccounted for in most marine insurance models. As a result, current underwriting frameworks are increasingly misaligned with the realities of the sector they insure.



insurance contracts are renegotiated on an annual basis. Unlike shipbuilding cycles, fleet renewal, or international treaty negotiations, underwriting decisions which are locked-in for longer periods, allowing insurers to send immediate market signals without waiting for new regulation or fleet replacement. This creates recurring opportunities to adjust pricing, coverage conditions, and disclosure requirements in ways that reflect evolving risk profiles. Even modest changes, when applied across a large and diverse fleet, can generate meaningful behavioural signals.

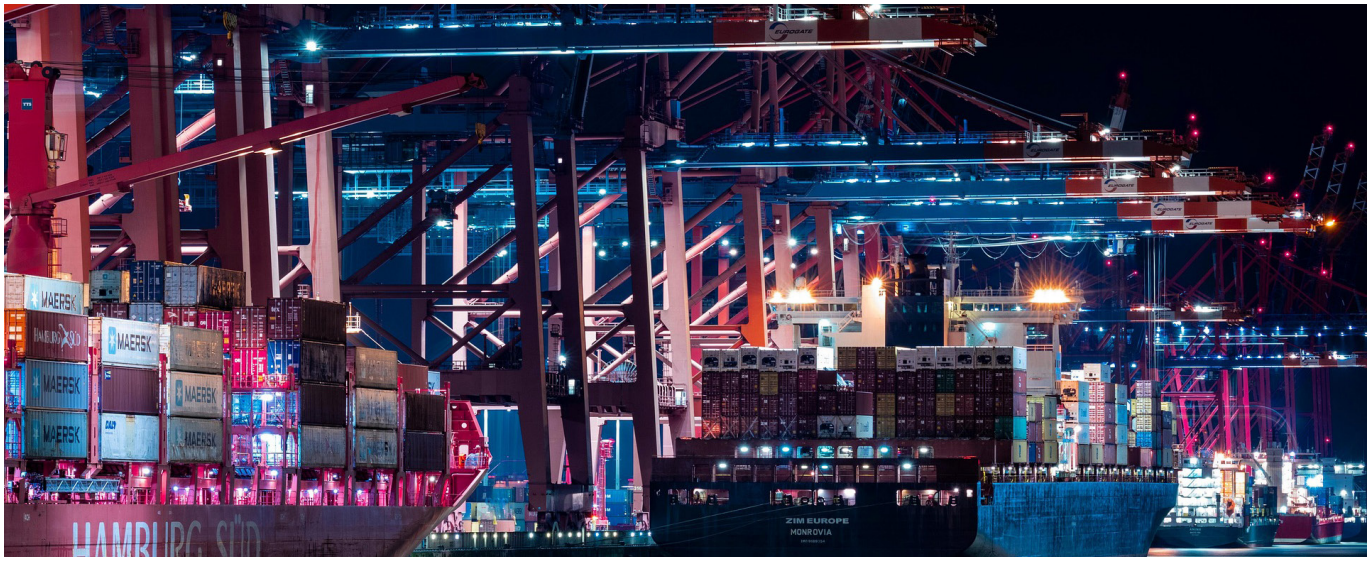
This paper does not argue that insurers should become environmental regulators. It argues that climate and biodiversity considerations increasingly influence the risks insurers already exist to price and manage. It seeks to bridge the gap between environmental ambition and underwriting practice by translating climate and ecological risks into insurance-relevant terms. In doing so, it positions marine insurance not as a substitute for regulation, but as a complementary mechanism capable of reinforcing policy objectives, rewarding early movers, and helping to steer the shipping sector toward a more resilient and sustainable future.

The paper is intended for a broad range of stakeholders involved in the maritime and insurance ecosystems, including marine insurers, Protection and Indemnity (P&I) Clubs, shipowners, financial institutions, policymakers, regulators, classification societies, and civil society organisations. While insurers are the primary focus, meaningful reform will require coordinated action across these actors. Accordingly, the paper concludes with practical recommendations tailored to the respective roles each stakeholder can play in integrating climate and biodiversity considerations into marine insurance and accelerating shipping decarbonisation.

In this paper, the term marine insurance refers primarily to insurance lines that directly affect vessel operation and design, namely Hull & Machinery (H&M) insurance and Protection & Indemnity (P&I) insurance.

Hull & Machinery insurance covers physical damage to vessels and their machinery, while P&I insurance, typically provided by mutual P&I Clubs, covers third-party liabilities, including pollution, crew injury, and wreck removal. Together, these insurance lines play a decisive role in shaping how vessels are designed, operated, and retrofitted, and therefore represent the most relevant leverage points for accelerating shipping decarbonisation.

Cargo insurance, which covers loss or damage to goods carried by sea and is typically purchased by cargo owners rather than shipowners, is not the primary focus of this analysis, as it has a more indirect influence on vessel-level operational and technological decisions.



1.1 A short-term risk horizon in a long-term transition

One of the central limitations of current underwriting practices is their reliance on short-term risk horizons. Premiums and coverage conditions are typically calibrated on the basis of recent loss experience and near-term operational factors. While this approach is appropriate for many traditional marine risks, it is poorly suited to capturing transition risks that unfold over longer timeframes, such as regulatory tightening, fuel market shifts, or the declining economic viability of high-emission vessels.

The shipping sector's decarbonisation pathway implies structural changes over the coming decades, including the phase-out of certain fuels, the introduction of new technical standards, and rising compliance costs. Vessels built or operated without regard to these trends will face increasing exposure to regulatory non-compliance, retrofit requirements, or early obsolescence. Yet these risks are rarely reflected in underwriting decisions, leading to the systematic under-pricing of

1.2 Environmental and social risks remain largely externalised

Despite growing recognition of environmental, social, and governance (ESG) risks across the financial sector, marine insurance has been slow to integrate such considerations in a systemic way[2]. Greenhouse gas emissions, air pollution, biodiversity impacts, and labour conditions generally remain external to underwriting assessments, unless they manifest directly as acute liability events[3].

This creates a situation in which insurers cover vessels whose operations contribute significantly to climate change, environmental degradation or Human rights violation[4], without accounting for the associated long-term risk implications. In particular, the absence of emissions performance from underwriting models means that operators have little insurance-related incentive to improve efficiency, adopt alternative propulsion, or avoid fuels with high upstream or non-CO_2 climate impacts.

The externalisation of these risks also raises questions of equity and responsibility. Environmental harm generated by shipping operations often disproportionately affects coastal communities, sensitive ecosystems, and future generations, while the financial mechanisms that enable these operations remain insulated from those impacts. As environmental accountability frameworks expand, this disconnect is likely to become increasingly difficult to sustain.

1.3 Structural conservatism and reluctance to innovate

Marine insurance, and P&I Clubs in particular, are structurally conservative by design. Mutualisation, pooled risk, and intense competition for members create strong incentives to avoid unilateral changes that could be perceived as increasing costs or reducing competitiveness. This constraint is structural rather than merely cultural: the twelve Clubs of the International Group operate through a shared Pooling Agreement and jointly procured reinsurance arrangements. Certain compulsory liability regimes also require evidence of insurance. P&I Clubs issue Blue Cards evidencing the relevant cover, on the basis of which flag State authorities issue the convention certificates required for vessels to trade. This creates a tension that the paper's recommendations must address directly. Clubs therefore cannot easily price out or exclude higher-emission vessels from core compulsory lines without leaving them unable to obtain the certification needed to trade lawfully. A tension this paper's recommendations should address directly, for example by confining differentiated pricing to non-compulsory elements of cover or to Hull & Machinery insurance (H&M), where competitive and contractual freedom is greater. Innovation in underwriting is therefore often incremental and cautious, particularly where new risk factors are difficult to quantify or lack historical precedent.

This conservatism has contributed to a reluctance to experiment with climate-aligned underwriting

2 UNEP FI, Managing environmental, social and governance risks in non-life insurance business (2020)
3 OXBOW Partners, ESG data for underwriting (2023)
4 UIMI, Modern slavery & forced labour: What marine insurers should be aware of (2025)



approaches[5], even where conceptual interest exists. Concerns about data availability, methodological robustness, and potential legal exposure frequently outweigh perceived benefits. As a result, insurers may acknowledge climate risk at a strategic level while continuing to apply underwriting models that are effectively climate-blind in practice.elements of cover or to Hull & Machinery insurance (H&M), where competitive and contractual freedom is greater. Innovation in underwriting is therefore often incremental and cautious, particularly where new risk factors are difficult to quantify or lack historical precedent.

1.4 Fragmentation and lack of common standards

Another significant barrier to reform is the fragmented nature of the regulatory and institutional landscape in which marine insurers operate[6]. Shipping is governed by a complex patchwork of international, regional, and national rules, while insurers themselves are subject to diverse prudential and supervisory regimes. This fragmentation makes it difficult to establish common standards[7] for climate and environmental risk in underwriting.

In the absence of widely accepted standards or frameworks, insurers face uncertainty about how to assess emissions performance, compare vessels operating in different contexts, or align their practices with evolving policy objectives. This uncertainty reinforces inertia, as insurers default to established risk factors rather than integrating new, less familiar dimensions.

1.5 Consequences for decarbonisation

Taken together, these limitations mean that current underwriting practices do not reflect the full risk profile of shipping in a world facing climate impacts and a changing regulatory environment. By focusing narrowly on short-term financial risk and excluding climate and environmental considerations, including

5 IAIS, Issues Paper on Climate Change Risks to the Insurance Sector (2021)
6 UNEP Finance Initiative, Insurance Industry and Climate Risk Landscape (2022)
7 EIOPA, Supervisory Statement on Sustainability in Insurance (2022)

those related to efforts to decarbonise the sector, marine insurance may inadvertently reinforce existing high-emission pathways and slow the adoption of cleaner technologies[8].

This outcome is not the result of deliberate opposition to decarbonisation, but of institutional structures and risk frameworks that have not yet caught up with the scale and nature of the challenge[9]. Addressing these shortcomings does not require insurers to abandon their core risk-management mandate. Rather, it requires a recalibration of underwriting practices to ensure that they reflect the evolving realities of climate, environmental, and transition risk in the shipping sector.

2. Climate and Transition Risk in Shipping: From Abstract Concern to Insurable Exposure

For climate considerations to be meaningfully integrated into marine insurance, they must be understood not as abstract externalities, but as material risk drivers that affect loss profiles, asset values, and liability exposure[10][11]. In shipping, climate and transition risks are increasingly foreseeable, measurable, and relevant to insurers' core mandates This section outlines how these risks manifest in practice and why they warrant systematic consideration in underwriting.

2.1 Physical climate risk

Physical climate risks are already altering the operating environment for global shipping[12]. Rising sea levels, increased frequency and intensity of storms, changing wind and wave patterns, and heat stress on infrastructure are contributing to[13]:

• higher incidence of weather-related incidents;

• port disruptions and congestion;

damage to vessels, cargo, and port facilities;

• increased claims linked to delays, groundings, and extreme conditions.

From an underwriting perspective, these risks are not speculative. Loss data increasingly reflects climate-related drivers, even where they are not explicitly labelled as such[14]. Across the insurance sector, natural-catastrophe losses have remained elevated in recent years, illustrating the growing financial significance of physical climate risk. While marine-specific losses are not directly comparable and are less consistently categorised, shipping is exposed to many of the same underlying physical drivers. While marine-specific losses are rarely categorised separately, shipping is increasingly exposed to the same underlying physical drivers. Vessels operating on particular routes or in

8 OECD, Decarbonising Maritime Transport: Pathways to Zero-Carbon Shipping (2018)
9 Forum for Insurance Transition to Net Zero, Closing the Gap : The emerging global agenda and the need for insurance-specific guidance (2024)
10 Geneva Association, Climate Change Risk Assessment for the Insurance Industry (2021).
11 Financial Stability Board (FSB), TCFD Recommendations (2017); IPCC, AR6 WGII & WGIII (2022).
12 IPCC, AR6 Working Group I – Physical Science Basis (2021).
13 IPCC, AR6 WGII – Impacts, Adaptation and Vulnerability (2022).
14 Swiss Re Group, Natural Catastrophe Loss Data (2024)

exposed regions may face heightened physical risk, which in turn affects insurance claims frequency and severity. As climate change progresses, historical loss patterns may become less reliable predictors of future exposure, increasing the importance of forward-looking risk assessment[15].

Physical climate risk therefore represents a core underwriting concern, not an external environmental issue[16]. Failure to account for it risks systematic underpricing of exposure in certain segments of the fleet.

2.2 Transition risk: regulation, markets, and asset viability

Transition risk arises from the costs driven by the structural shift required to align shipping with climate objectives[17]. This includes changes in regulation, fuel markets, technology standards, and investor expectations. For marine insurers, transition risk manifests in several interrelated ways.

First, regulatory risk is increasing. While the pace and stringency of regulation remain uncertain, the direction of travel is clear[18]. Measures affecting carbon pricing, fuel standards, emissions reporting, and operational efficiency are proliferating across jurisdictions. Vessels that are poorly positioned to comply with future requirements may face:

- higher operating costs;
- forced retrofits;
- restricted access to ports or trade routes;
- reduced charter attractiveness.

Second, fuel and technology risk is becoming more pronounced[19]. As shipping explores alternative fuels and propulsion systems, insurers face the challenge of assessing new risk profiles[20]. At the same time, continued reliance on high-emission or fuels with highly volatile prices exposes operators to price shocks, supply disruptions, and regulatory penalties. Assets locked into transitional or misaligned fuel pathways may experience accelerated depreciation or loss of competitiveness[21].

Third, asset-stranding risk is emerging as a tangible concern. Vessels built or retrofitted without consideration of long-term climate alignment may become economically obsolete well before the end of their technical lifespan. The direct financial consequences of declining asset value fall primarily on shipowners and lenders. For insurers, the relevance is more indirect: deteriorating commercial prospects may affect maintenance expenditure, vessel utilisation, ownership quality or operating behaviour, which can in turn increase insured loss exposure. At portfolio level, insurers may also face concentrations in vessel types or technologies whose risk characteristics change as the transition progresses[22].

These dynamics directly affect the risk profile of insured fleets. Ignoring transition risk does not make it disappear; it simply delays its recognition.

2.3 Liability and reputational risk

In addition to physical and transition risks, shipping insurers face growing liability and reputational exposure linked to climate and environmental harm[23]. Litigation related to environmental damage, pollution, and failure to manage foreseeable risks is expanding across sectors[24]. While shipping has not

15 Bank for International Settlements (BIS), Climate-related financial risks: a forward-looking approach (2021).
16 IAIS, Issues Paper on Climate Change Risks to the Insurance Sector (2021).
17 IPCC, AR6 WGIII – Mitigation Pathways (2022)
18 IMO, Revised GHG Strategy (2023); EU, Fit for 55 Maritime Package.
19 IEA, Energy Technology Perspectives – Shipping (2023).
20 IEA, The Future of Hydrogen (2019); updated maritime briefs.
21 OECD, Stranded Assets and Climate Transition (2019).
22 Geneva Association, Insurance and Climate Transition Risk (2022).
23 IAIS, Application Paper on the supervision of climate-related risks in the insurance sector (2025)
24 UNEP, Global Climate Litigation Report (2023)

yet experienced climate litigation at the scale seen in sectors such as energy or finance, climate litigation is expanding rapidly worldwide and legal theories relating to directors' duties, financial institutions' responsibilities, and climate-related disclosure obligations continue to evolve[25].

As expectations around corporate climate responsibility increase, insurers may face scrutiny over the composition of their portfolios and their role in enabling high-emission activities[26]. Reputational risk is no longer confined to public-facing brands; financial institutions, including insurers, are increasingly subject to stakeholder pressure, media attention, and regulatory pressure.

From an underwriting standpoint, reputational exposure can translate into financial risk through:

- increased regulatory attention;
- loss of clients or partners;
- constraints on capital or reinsurance;
- heightened supervisory scrutiny.

These considerations reinforce the case for integrating climate and environmental risk into underwriting frameworks as part of prudent risk governance[27].

2.4 Making climate and transition risk insurable

For insurers, the key challenge is not whether climate and transition risks exist, but how to assess and price them in a defensible manner[28]. Several developments make this increasingly feasible.

Advances in emissions monitoring, vessel tracking, and data analytics now allow for more granular assessment of operational performance. Regulatory reporting regimes provide baseline data on emissions and efficiency. Scenario analysis and transition pathways, such as those developed by the Network for Greening the Financial System (NGFS), the International Energy Agency (IEA), and the Intergovernmental Panel on Climate Change (IPCC), while imperfect, provide structured approaches for evaluating future regulatory, market, and physical climate exposure.

Importantly, insurers are not required to predict the precise trajectory of regulation or technology to begin integrating climate risk. As with other emerging risks, underwriting can rely on proxies, ranges, and qualitative indicators, refining models over time as data improves.

Importantly, integrating climate and biodiversity considerations into underwriting is not about rewarding vessels for reducing global emissions per se. Rather, it is about distinguishing between assets that are likely to face different future risk profiles. Vessels with lower emissions, greater energy efficiency, or technologies that are aligned with evolving regulatory and market expectations may be less exposed to fuel price volatility, regulatory tightening, stranded asset risk, operational disruption and certain liability claims over their lifetime. By recognising these differences, insurers can improve underwriting accuracy, strengthen portfolio resilience, reduce unexpected losses and position themselves more effectively in a rapidly changing risk landscape.

The integration of climate and transition risk into marine insurance should therefore be understood as an evolutionary process, consistent with how the sector has historically adapted to new risk categories[29]. By beginning to reflect these risks in premiums, coverage terms, and disclosure requirements, insurers can better align underwriting practice with the evolving climate-related physical, transition and liability risks facing the shipping sector.

25 https://www.unep.org/resources/report/global-climate-litigation-report-2025-status-review
26 UNEP FI, Insuring the Climate Transition (2021).
27 Geneva Association, Insurance and Climate Risk Governance (2022).
28 IAIS, Application Paper on the supervision of climate-related risks in the insurance sector (2025)
29 Geneva Association, Insurance and Climate Transition Risk (2022).

3. Biodiversity and Environmental Risk: From Externality to Material Exposure

While climate risk is increasingly recognised as a core financial concern, biodiversity and wider environmental risks remain even more weakly integrated into marine insurance underwriting. Yet shipping activities affect marine ecosystems in ways that are increasingly subject to regulatory scrutiny, liability exposure, and reputational risk. As environmental accountability frameworks expand, these impacts are moving steadily from the periphery of risk assessment toward its centre.

For marine insurers, biodiversity and environmental risks are not abstract ecological concerns. They intersect directly with liability regimes, loss prevention, operational constraints, and the evolving expectations placed on financial institutions[30]. Ignoring these risks exposes insurers to blind spots that may become financially material over time.

3.1 Shipping's biodiversity and environmental footprint

Shipping contributes to biodiversity loss and ecosystem degradation through multiple pathways, including:

• emissions of black carbon, particularly in sensitive regions where deposition accelerates ice melt and ecosystem disruption[31];

• underwater noise that interferes with marine mammals' communication, navigation, and feeding patterns;

• operational discharges such as scrubber effluent, wastewater, and accidental spills;

• the introduction of invasive species through ballast water;

• cumulative impacts in ecologically sensitive or heavily trafficked sea areas.

While many of these impacts have historically been treated as environmental externalities, regulatory and societal tolerance for such framing is diminishing. Environmental harm that was once considered diffuse and unquantifiable is increasingly being linked to specific activities, operators, and routes, increasing liability.

3.2 Why biodiversity risk matters to insurers

From an underwriting perspective, biodiversity and environmental risks matter for several reasons.

First, liability exposure is expanding. Environmental damage can trigger clean-up costs, compensation claims, and legal action, particularly where harm affects protected areas, fisheries, or coastal communities[32]. As environmental law evolves, the threshold for liability is likely to lower, and the scope of recoverable damages to widen.

Second, regulatory risk is intensifying. Measures addressing air pollution, underwater noise, discharge standards, and protected areas are proliferating at international, regional, and national levels. Vessels operating in sensitive regions may face tighter operating constraints, higher compliance costs, or restrictions on access. For insurers, this translates into increased uncertainty and potential loss exposure.

Third, reputational and portfolio risk is rising. Financial institutions are increasingly assessed not only on financial performance but also on their contribution to environmental outcomes, through evolving ESG expectations, supervisory guidance and investor scrutiny[33]. Biodiversity loss has begun to feature prominently in ESG assessments, supervisory discussions, and public debate. Insurers underwriting activities associated with visible environmental harm may face reputational consequences that affect market position, reinsurance access, or regulatory relationships.

30 Geneva Association, Insurance and Climate Transition Risk (2022).
31 ICCT, Scrubber Discharge and Environmental Impacts (2020).
32 UNEP, Global Climate Litigation Report (2023)
33 https://www.unepfi.org/industries/banking/2025-in-review-building-resilience-and-advancing-the-transition/

Fourth, systemic risk considerations are emerging. Biodiversity loss and ecosystem degradation can exacerbate physical climate risk, undermine coastal resilience, and increase the frequency and severity of certain loss events. From a systemic perspective, environmental degradation and climate risk are interlinked, reinforcing the case for integrated risk assessment.

3.3 Signals from the broader insurance sector

Although marine insurance has been slow to engage with biodiversity risk, other insurance lines offer early signals of how this integration may evolve. In property, agriculture, and catastrophe insurance, biodiversity and ecosystem services are increasingly recognised as factors that influence loss prevention and resilience[34]. At the same time, global initiatives on nature-related financial disclosure, particularly the Taskforce on Nature-related Financial Disclosures (TNFD)[35], are gaining traction, signalling a broader shift in how environmental risk is conceptualised within financial markets.

These developments suggest that marine insurance is unlikely to remain insulated from biodiversity considerations indefinitely. As expectations around environmental risk management converge across financial sectors, marine insurers will face growing pressure to demonstrate that their underwriting practices reflect emerging understandings of ecological risk.

3.4 Integrating biodiversity risk into underwriting logic

As with climate risk, the challenge for marine insurers is not whether biodiversity risk exists, but how it can be incorporated into underwriting in a proportionate and defensible manner[36]. Integration does not require insurers to become environmental regulators. Rather, it involves recognising that certain operational practices and trading patterns carry higher environmental and regulatory risk than others.

Potential entry points include:

- heightened scrutiny of operations in ecologically sensitive regions;
- consideration of fuel choice and emission profiles that affect local and regional ecosystems;
- attention to technologies and practices that mitigate environmental harm, such as noise-reduction measures or avoidance of harmful discharges;
- use of environmental performance indicators as part of broader ESG risk assessments.

Importantly, biodiversity risk need not be assessed in isolation. It can be integrated alongside climate, regulatory, and transition risk as part of a holistic underwriting framework that reflects the full spectrum of environmental exposure associated with shipping operations.

3.5 From environmental concern to underwriting relevance

The integration of biodiversity and environmental risk into marine insurance is likely to follow a similar trajectory to climate risk: gradual, iterative, and driven by a combination of regulatory pressure, data availability, and shifting market expectations. Early engagement offers insurers the opportunity to shape this evolution proactively, rather than responding reactively once standards and liabilities are imposed externally.

For the shipping sector as a whole, recognising biodiversity risk as an underwriting concern reinforces the broader transition toward operating within planetary boundaries. For insurers, it represents a necessary step in aligning risk assessment with the realities of a changing environmental and regulatory landscape.

34 Swiss Re Institute, Nature and Insurance (2021).
35 https://tnfd.global/
36 IAIS, Application Paper on the supervision of climate-related risks in the insurance sector (2025)

4. Opportunities for Reforming Marine Insurance

The shortcomings of current underwriting practices do not reflect a lack of capacity within the marine insurance sector, but rather the absence of structured pathways to integrate new categories of risk[37]. A combination of policy momentum, data innovation, and evolving financial norms has created a window of opportunity for insurers to modernise underwriting in ways that strengthen risk management while supporting shipping's decarbonisation[38].

This section outlines the most relevant opportunities for reform, focusing on mechanisms that are feasible within existing insurance structures and aligned with insurers' commercial and prudential responsibilities.

4.1 Leveraging policy and regulatory momentum

Shipping is increasingly subject to climate-related regulation at international, regional, and national levels[39]. While implementation timelines and stringency vary, the cumulative effect of these measures is to raise the baseline level of transition risk across the sector.

Internationally, the direction of travel toward emissions reduction and improved environmental performance is clear, even where consensus remains contested. Regionally, policies such as carbon pricing mechanisms, fuel standards, and efficiency regulations are reshaping operating conditions for vessels trading in major markets. These developments create differentiated exposure across fleets, depending on fuel choice, efficiency, and preparedness for future requirements.

For marine insurers, this policy landscape represents an opportunity rather than a threat[40]. Insurers that begin to reflect regulatory and transition risk in underwriting decisions can:

- better anticipate future claims exposure;
- differentiate between vessels based on forward-looking risk;
- avoid sudden portfolio adjustments when regulatory thresholds tighten.

Aligning underwriting with emerging policy signals enables insurers to move from reactive compliance toward proactive risk governance.

4.2 Building on voluntary financial frameworks

Voluntary financial frameworks have begun to play an important role in aligning parts of the shipping finance ecosystem with climate objectives. The Poseidon Principles, initially developed for shipping finance, illustrate how portfolio-level climate alignment can be measured and disclosed using common metrics.

Although uptake within marine insurance remains limited[41], these frameworks demonstrate several important points:

- climate alignment can be assessed without perfect data;
- portfolio-level approaches allow for gradual improvement rather than immediate exclusion;
- voluntary commitments can shape norms ahead of regulation.

For insurers, adapting similar principles to underwriting offers a way to engage with climate risk without disrupting existing mutual risk-sharing arrangements or placing early adopters at a competitive disadvantage. Portfolio-level assessment, disclosure, and benchmarking can complement vessel-level underwriting decisions and provide strategic oversight of exposure.

37 IAIS, Application Paper on Climate Change Risk Management in the Insurance Sector (2025)
38 UNEP Finance Initiative, Insuring the Climate Transition (2021)
39 IMO, Revised GHG Strategy (2023)
40 Geneva Association, Insurance and Climate Transition Risk (2022).
41 UNEP FI, The Climate Risk Tool Landscape (2022)

4.3 Advances in emissions data and performance monitoring

One of the most significant enablers of climate-aligned underwriting is the rapid improvement in emissions and performance data[42]. Advances in satellite tracking, onboard monitoring systems, and data analytics now allow for increasingly granular assessment of vessel operations[43].

Combined with regulatory reporting requirements, these tools provide insurers with access to:

verified emissions and efficiency data;

• operational indicators linked to fuel consumption;

• historical performance trends across fleets.

While data gaps and inconsistencies remain, the direction of travel is clear. Insurers no longer need to rely solely on proxies or assumptions to assess environmental performance. Instead, they can begin to integrate emissions-related indicators into underwriting in a phased and proportionate manner.

Importantly, insurers are well positioned to shape data standards through their information requirements. By signalling that emissions and fuel-use data are relevant to underwriting, insurers can accelerate improvements in data quality across the sector.

4.4 Underwriting innovation through premium differentiation

Premium differentiation represents one of the most direct and effective tools available to marine insurers. Linking premiums to factors such as carbon intensity, fuel choice, or operational efficiency can create immediate financial incentives for improved performance.

Such differentiation does not require insurers to make binary judgments about acceptable and unacceptable vessels. Instead, it allows for:

• gradual scaling of incentives;

• recognition of incremental improvements;

• differentiation within existing risk pools.

Crucially, premium differentiation can be framed in familiar underwriting terms. Lower emissions intensity, reduced fuel dependence or greater regulatory resilience may reduce particular forms of transition or portfolio exposure, but whether this translates into lower insured risk must be demonstrated rather than assumed. Conversely, vessels exposed to higher transition or environmental risk may warrant higher premiums or additional scrutiny.

4.5 The strategic role of NGOs and public accountability

Non-governmental organisations play an important role in shaping expectations around corporate responsibility and environmental performance. In the context of marine insurance, NGOs can act as:

• conveners of cross-sector dialogue;

• translators between policy ambition and financial practice;

• sources of public accountability and narrative pressure.

Experience in other sectors, including fossil fuel divestment campaigns, demonstrates that NGO engagement can accelerate change by reframing what is considered acceptable or prudent. When applied strategically, such engagement can support insurers that are willing to lead, while increasing expectations on the sector as a whole.

The objective is not to politicise underwriting, but to ensure that environmental and climate risks are recognised as legitimate financial concerns that warrant attention within risk management frameworks.

4.6 A convergence of opportunity

Taken together, policy momentum, data innovation, financial frameworks, and shifting public expectations create a convergence of opportunity for reforming marine insurance. Insurers that engage early stand to benefit from improved risk governance, enhanced credibility, and greater resilience in a rapidly changing market.

42 IEA, Tracking Clean Energy Progress – Shipping (2023).

43 Carbon Trust, Digitalisation and Data in Shipping (2022).

For the shipping sector, the integration of climate and environmental risk into insurance represents a critical step toward aligning financial incentives with decarbonisation objectives. For insurers, it offers a pathway to modernise underwriting in line with the evolving realities of the risks they insure.

5. Practical Underwriting Tools for Climate- and Biodiversity-Aligned Insurance

Reforming marine insurance to reflect climate and biodiversity risk does not require a wholesale redesign of underwriting systems[44]. Many of the necessary tools already exist within insurers' current practices[45]. What is required is a targeted adaptation of these tools to incorporate environmental performance and transition exposure in a proportionate and defensible way[46].

This section outlines practical mechanisms that insurers and P&I Clubs can deploy individually or in combination, depending on institutional structure, risk appetite, and data availability.

5.1 Premium differentiation linked to emissions performance

Premium differentiation is one potential tool available to insurers where differences in environmental or transition performance can be linked credibly to underwriting risk[47]. By adjusting premiums to reflect emissions performance and fuel-related risk, insurers can send clear economic signals while remaining within familiar underwriting frameworks[48].

Premium differentiation can be based on:

• carbon intensity metrics relative to vessel class and trade;

• fuel type and associated transition risk, including upstream emissions and price volatility;

demonstrated energy-efficiency measures, such as slow steaming or wind-assisted propulsion;

• participation in verified performance improvement programmes[49].

This approach allows insurers to reward incremental improvements rather than imposing binary thresholds[50]. Importantly, it can be implemented on an opt-in basis or through pilot schemes, reducing concerns about competitive distortion while testing methodologies and data reliability.

5.2 Coverage conditions and deductibles as risk signals

Beyond premiums, insurers can use coverage terms and deductibles to reflect transition and environmental risk[51]. This may include:

• differentiated deductibles for vessels with higher regulatory or fuel risk exposure;

• enhanced coverage conditions linked to compliance readiness or disclosure quality;

• additional scrutiny for vessels operating in sensitive regions or relying on high-risk fuels.

Such measures are already standard practice for other categories of risk and can be adapted to environmental considerations without introducing novel legal concepts. Framing these adjustments as loss-

44 UNEP FI Principles for Sustainable Insurance, Managing environmental, social and governance risks in non-life insurance business (2020)
45 EIOPA, Consultation Paper on the Prudential Treatment of Sustainability Risks (2023).
46 IAIS, Application Paper on Climate Change Risk Management in the Insurance Sector (2025)
47 EIOPA, Consultation Paper on the Prudential Treatment of Sustainability Risks (2023)
48 IAIS, Application Paper on Climate Change Risk Management in the Insurance Sector (2025)
49 Poseidon Principles for Marine Insurance, Third Annual Disclosure Report (2025)
50 UNEP FI Principles for Sustainable Insurance, Managing environmental, social and governance risks in non-life insurance business (2020)
51 Idem

prevention and risk-management measures reinforces their legitimacy.

5.3 Disclosure requirements as a foundation for underwriting reform

Meaningful integration of climate and biodiversity risk into underwriting depends on access to reliable data. Insurers are therefore uniquely positioned to accelerate transparency by requiring emissions and fuel-use disclosure as part of insurance contracts[52].

Disclosure requirements may include:

- vessel-level greenhouse gas emissions data;
- fuel type and consumption profiles;
- carbon intensity trajectories over time;
- relevant environmental performance indicators.

By embedding disclosure expectations within underwriting processes, insurers can improve risk assessment while contributing to broader transparency across the sector. Over time, consistent disclosure enables benchmarking, portfolio-level analysis, and more refined pricing models[53].

5.4 ESG and biodiversity risk checklists for marine insurance

To support consistent integration of environmental considerations, insurers can develop ESG and biodiversity risk checklists tailored specifically to marine insurance. These checklists would complement, rather than replace, existing technical assessments.

Key elements may include:

- emissions intensity and transition readiness;
- fuel-related climate and pollution risks;
- operations in ecologically sensitive areas;
- use of technologies or practices that mitigate environmental harm;
- labour and social risk indicators relevant to maritime operations.

Such checklists provide underwriters with structured guidance while allowing for professional judgment. They also facilitate internal consistency and enable insurers to track environmental exposure across portfolios.

5.5 Incentivising innovation without penalising experimentation

A common concern within the insurance sector is that new technologies and operational practices may introduce unfamiliar risks. Underwriting tools should therefore be designed to encourage innovation without creating barriers to experimentation[54].

This may involve:

- time-limited incentives for early adopters of low-emission technologies;
- collaboration with classification societies to validate risk assumptions;
- conditional coverage structures that evolve as performance data accumulates.

By sharing risk intelligently rather than avoiding it altogether, insurers can support the transition while maintaining prudential standards.

5.6 Managing fairness and proportionality

Equity considerations are essential to ensure that underwriting reform does not disproportionately disadvantage smaller operators or fleets operating in constrained contexts. Proportionality can be maintained by:

- assessing performance relative to vessel type and trade;
- recognising improvement trajectories rather than absolute benchmarks;
- coordinating insurance incentives with broader transition support mechanisms.

52 UNEP FI Principles for Sustainable Insurance, Managing environmental, social and governance risks in non-life insurance business (2020)

53 Poseidon Principles for Marine Insurance, Third Annual Disclosure Report (2025)

54 EIOPA, Consultation Paper on the Prudential Treatment of Sustainability Risks (2023)

This approach aligns climate ambition with practical realities, strengthening the legitimacy and durability of reform.

5.7 From tools to practice

The tools outlined above are not mutually exclusive. Insurers may choose to begin with disclosure requirements, pilot premium differentiation, or portfolio-level ESG assessments, refining approaches over time. What matters is not immediate perfection, but a clear direction of travel toward underwriting practices that reflect the full spectrum of risk in a decarbonising shipping sector[55].

By embedding climate and biodiversity considerations into everyday underwriting decisions, marine insurance can move from passive risk transfer to active risk management, helping to align commercial incentives with long-term environmental resilience.

6. Aligning Marine Insurance with Shipping Finance and the Poseidon Principles

Marine insurance does not operate in isolation. Decisions made by insurers interact continuously with those taken by banks, investors, and other providers of capital[56]. In shipping, this interaction is particularly important: vessels are long-lived, capital-intensive assets, and their commercial viability depends on the combined assessment of credit risk, operational risk, and transition risk[57]. Aligning insurance practices with shipping finance therefore offers a powerful opportunity to reinforce decarbonisation incentives across the sector.

6.1 The current disconnect between finance and insurance

Over the past decade, shipping finance has begun to engage more systematically with climate risk[58]. Frameworks such as the Poseidon Principles have introduced portfolio-level climate alignment metrics for banks, linking lending decisions to the emissions trajectories of financed fleets. This represents a significant step toward transparency and accountability in shipping finance.

However, this progress has not been fully mirrored in marine insurance. While banks increasingly require emissions disclosure and climate-alignment reporting, insurers continue to underwrite vessels largely on the basis of traditional risk factors. As a result, disclosure obligations are not consistently translated into pricing or risk signals, and shipowners may face conflicting incentives across different parts of the financial system[59].

This disconnect weakens the overall effectiveness of climate-aligned finance. Where banks signal concern about emissions performance but insurance terms remain unchanged, the economic signal to operators is diluted.

6.2 Reinforcing incentives through signal alignment

Aligning insurance underwriting with climate-aware shipping finance can strengthen incentives for decarbonisation without creating new regulatory burdens[60]. When banks and insurers rely on comparable metrics and risk assessments, their decisions reinforce one another, shaping behaviour more effectively than either could alone.

For example:

- banks may condition lending terms on emissions

55 EIOPA, Consultation Paper on the Prudential Treatment of Sustainability Risks (2023)
56 IAIS, Application Paper on the supervision of climate-related risks in the insurance sector (2025).
57 Poseidon Principles Association, Annual Disclosure Report 2025
58 Idem
59 IAIS, Application Paper on the supervision of climate-related risks in the insurance sector (2025).
60 Poseidon Principles Association, Annual Disclosure Report 2025

trajectories or improvement plans;

• insurers may adjust premiums or coverage terms based on similar performance indicators;

• classification societies and data providers can support both assessments through consistent methodologies.

This convergence creates a coherent financial environment in which climate performance is recognised as a material determinant of both capital cost and operational risk.

6.3 The role of the Poseidon Principles

The Poseidon Principles provide a useful reference point for this alignment. Marine insurers first formalised a related approach through the Poseidon Principles for Marine Insurance (PPMI), launched in 2021 to assess and disclose the climate alignment of Hull & Machinery portfolios. In September 2026, PPMI ceased operating as a separate initiative and was integrated into the broader Poseidon Principles framework, with marine insurers now able to participate as associate members. This evolution reinforces the case for closer alignment between shipping finance and insurance, while also providing useful lessons on the practical limits of voluntary insurance-led climate alignment, including data access and insurer leverage. This paper's recommendations should therefore be read as reinforcing and extending an existing signatory framework, rather than proposing an entirely novel one, with particular attention to broadening participation beyond the current signatory base, extending coverage to P&I business (which remains largely outside the framework), and translating portfolio-level alignment scores into vessel-level underwriting terms. Although originally developed for shipping finance, their core features are relevant to insurance:

• use of standardised emissions metrics;

• portfolio-level assessment rather than binary exclusion;

• emphasis on continuous improvement and transparency.

For insurers, engaging with the logic underpinning the Poseidon Principles does not require formal adoption of the framework. Rather, it offers a conceptual template for integrating climate considerations into underwriting in a way that is familiar to financial institutions and acceptable to regulators[61].

By aligning underwriting practices with the metrics already used by banks, insurers can reduce duplication, improve data consistency, and enhance the credibility of climate-linked pricing or coverage adjustments.

6.4 Implications for fleet renewal and retrofitting

Alignment between insurance and finance has direct implications for fleet renewal and retrofitting decisions[62]. . Where insurers and banks can demonstrate that improved environmental performance corresponds to reduced risks relevant to their respective exposures, vessels that invest in energy efficiency, alternative propulsion, or operational optimisation can benefit from:

• lower insurance premiums;

• improved access to capital;

• enhanced charter attractiveness.

Conversely, vessels that remain on high-risk pathways may face increasing costs across multiple dimensions, accelerating the economic case for transition.

This dynamic is particularly important for technologies that require upfront investment but deliver long-term risk reduction, such as wind-assisted propulsion or efficiency retrofits[63]. Consistent signals from finance and insurance can help overcome hesitation and unlock capital for these measures.

6.5 Strengthening portfolio-level risk management

For both insurers and banks, portfolio-level

61 IAIS, Application Paper on the supervision of climate-related risks in the insurance sector (2025).
62 Poseidon Principles Association, Annual Disclosure Report 2025.
63 Idem

assessment is essential to managing systemic risk[64]. Climate change and environmental degradation do not affect individual vessels in isolation; they shape market conditions, regulatory environments, and loss patterns across entire portfolios[65].

Aligning insurance underwriting with climate-aware finance enables institutions to:

• assess aggregate exposure to transition risk;

• identify concentrations of environmental risk;

• plan for gradual portfolio rebalancing rather than abrupt adjustment.

This perspective supports financial stability while facilitating a managed transition for the shipping sector.

6.6 A coordinated pathway forward

Closer alignment between marine insurance and shipping finance does not require new institutions or binding commitments[66]. It can be achieved through:

• shared metrics and data standards;

• dialogue between insurers and Poseidon Principles-aligned banks;

• coordinated pilot initiatives that test integrated approaches.

By reinforcing climate signals across capital and risk markets, insurance and finance together can play a decisive role in accelerating shipping decarbonisation, complementing regulatory action and supporting long-term resilience.

7. Illustrative Scenarios

The integration of climate and biodiversity risk into marine insurance underwriting is often perceived as conceptually appealing but operationally uncertain. Illustrative scenarios can help demonstrate how insurance-based incentives might function in practice, using tools and logic that are already familiar to insurers, shipowners, and financiers. The examples below are not intended as exhaustive models, but as feasible pathways that could be refined and scaled through pilot initiatives.

7.1 Emissions-linked premium differentiation for operational efficiency

In this scenario, a marine insurer introduces a voluntary underwriting feature that links a portion of a vessel's premium to its carbon intensity relative to peers operating in similar trades. Participation is optional and framed as a loss-prevention and risk-management enhancement.

Vessels that demonstrate lower-than-average emissions intensity, verified through existing monitoring and reporting data, receive a modest premium adjustment reflecting reduced exposure to:

• regulatory tightening,

• fuel price volatility,

• and future retrofit requirements.

Conversely, vessels with persistently high emissions intensity are subject to enhanced scrutiny, including closer review of transition plans and compliance readiness. Importantly, this approach does not rely on absolute thresholds or exclusions. Instead, it rewards continuous improvement and recognises relative performance, reducing the risk of competitive distortion while creating a clear incentive to optimise operations.

Over time, as data quality improves, the insurer is able to refine differentiation bands and extend the approach across a broader segment of the portfolio.

64 Poseidon Principles Association, Annual Disclosure Report 2025
65 IAIS, Application Paper on the supervision of climate-related risks in the insurance sector (2025).
66 Poseidon Principles Association, Annual Disclosure Report 2025

7.2 Insurance incentives for wind-assisted propulsion

Wind-assisted propulsion provides a useful illustration of how insurance incentives could support technologies that reduce emissions while enhancing operational resilience. In this scenario, an insurer collaborates with a classification society to assess the risk profile of vessels retrofitted with wind propulsion technologies.

Based on this assessment, vessels equipped with certified wind-assisted systems benefit from:

• recognition of reduced fuel consumption and emissions exposure;

• improved resilience to fuel price volatility;

• lower long-term transition risk.

These factors are reflected in underwriting through premium adjustments or enhanced coverage terms. The insurer may also offer time-limited incentives for early adopters to reflect the learning benefits associated with first-mover data collection.

Crucially, the underwriting approach does not assume that unfamiliar technology, such as wind propulsion, is inherently higher-risk. Technical validation and operational data allow the insurer to assess both the new risks introduced by the retrofit and any risk reductions it may provide. This reframing helps normalise the technology within insurance markets and reinforces its commercial attractiveness.

7.3 Managing fuel transition risk through underwriting

Fuel choice represents a major source of transition risk for shipping. In this scenario, an insurer incorporates fuel-related risk assessment into underwriting by considering factors such as:

• regulatory exposure associated with specific fuels;

• upstream emissions and pollution profiles;

• price volatility and supply uncertainty.

Rather than excluding particular fuels outright, the insurer uses this assessment to inform coverage conditions and premium differentiation. Vessels relying on fuels with higher regulatory or transition risk may face increased premiums or enhanced disclosure requirements, while those pursuing lower-risk pathways benefit from more favourable terms.

This approach allows insurers to reflect forward-looking risk without attempting to predict the outcome of policy debates or technology competition. It also provides shipowners with a clearer signal about how fuel choices may affect long-term insurability.

7.4 Portfolio-level alignment across insurance and finance

In a more systemic scenario, a marine insurer aligns elements of its underwriting framework with the metrics used by Poseidon Principles–aligned banks. Emissions intensity and improvement trajectories are assessed consistently across lending and insurance decisions, enabling coordinated signals to shipowners.

A vessel demonstrating credible progress toward improved environmental performance benefits simultaneously from:

• more favourable lending terms,

• differentiated insurance premiums,

• improved access to charter markets.

This alignment reduces fragmentation across the financial system and strengthens the economic case for early investment in decarbonisation measures. From the perspective of insurers and banks, it enhances portfolio-level risk management by identifying concentrations of transition risk and supporting gradual rebalancing.

7.5 Lessons from the scenarios

Across these illustrative examples, several common lessons emerge:

• climate-aligned underwriting does not require binary judgments or immediate sector-wide change;

• relative performance and improvement trajectories provide a practical basis for differentiation;

• collaboration with technical authorities is essential to manage unfamiliar risks;

• insurance incentives are most effective when reinforced by finance and policy signals.

These scenarios demonstrate that insurance-based levers can operate within existing market structures, offering a pragmatic route to accelerating decarbonisation while strengthening risk governance.

8. From Theory to Practice: Designing Credible Insurance Pilots

Translating climate- and biodiversity-aligned underwriting concepts into practice requires careful design. Marine insurance operates within tight prudential, legal, and competitive constraints, and any reform must respect these realities to be viable. Pilot initiatives offer a pragmatic pathway forward, allowing insurers and partners to test new approaches, generate data, and build confidence without committing to immediate sector-wide change.

This section outlines principles for designing credible insurance pilots and identifies the conditions necessary for their success.

8.1 Why pilots matter

Pilots play a critical role in bridging the gap between conceptual ambition and operational feasibility. They allow insurers to:

• test methodologies for integrating emissions and environmental risk into underwriting;

• assess data quality and comparability in real-world contexts;

• evaluate potential impacts on premiums, claims, and client behaviour;

• manage legal and competitive concerns through limited scope and voluntary participation.

For shipowners and financiers, pilots provide an opportunity to understand how insurance-based incentives may affect costs and decision-making, while retaining flexibility to adapt.

8.2 Core principles for pilot design

Effective insurance pilots share several common characteristics:

- Voluntary and opt-in participation

Participation should be voluntary, allowing insurers and insured parties to engage without coercion. This reduces resistance and enables experimentation among willing participants.

- Benefit-based incentives

Early pilots are most credible when they focus on rewarding improved performance rather than penalising poor performers. Premium reductions, enhanced coverage terms, or recognition of best practice are more likely to gain acceptance than punitive measures. A related design risk is adverse selection: voluntary, benefit-based pilots will tend to attract vessels and operators that are already strong environmental performers, since they stand to gain the most from participating. This is a reasonable and expected feature of early-stage pilots, useful for testing methodology, but it means pilot results should not be read as evidence of fleet-wide behavioural change until participation broadens or disclosure requirements become a standard condition of coverage rather than an opt-in feature.

- Technical credibility

Pilots should be grounded in robust technical assessment, ideally supported by classification societies or independent experts. This helps ensure that underwriting adjustments are defensible and aligned with loss-prevention objectives.

- Transparency and clarity

Participants should understand how performance metrics are assessed, how incentives are applied, and what data is required. Clear communication reduces uncertainty and builds trust.

- Scalability by design

Even small pilots should be designed with future scaling in mind. Methodologies, data requirements, and governance arrangements should be capable of expansion if successful.

8.3 Key stakeholders in pilot initiatives

Successful pilots require collaboration across multiple parts of the shipping ecosystem, including:

• marine insurers or P&I Clubs willing to test underwriting adjustments;

• classification societies providing technical validation;

• shipping finance institutions aligned with climate objectives;

• data and emissions analytics providers;

• a limited number of shipowners or charterers

prepared to participate.

Each stakeholder brings distinct expertise, and coordination is essential to avoid duplication or conflicting signals.

8.4 Managing legal and competitive considerations

Legal and competitive concerns are often cited as barriers to underwriting innovation. Pilots can address these concerns by:

• avoiding discriminatory practices or absolute exclusions;

• framing adjustments as risk-based rather than normative;

• ensuring compliance with competition law through pre-competitive collaboration;

• maintaining confidentiality of commercially sensitive data.

Competition-law considerations warrant particular care in the P&I context. The former EU Insurance Block Exemption Regulation is no longer in force, meaning that insurance-sector arrangements must be assessed under the general competition-law framework, including Article 101(3) TFEU where relevant. Any ESG or biodiversity criteria developed collectively by P&I Clubs should therefore be reviewed by competition counsel and, where possible, structured as individually adopted underwriting guidance rather than jointly binding pricing or underwriting criteria.

8.5 Data governance and confidentiality

Data quality and confidentiality are central to pilot success. Clear protocols are required to:

• define which data is collected and how it is verified;

• protect commercially sensitive information;

• ensure consistent treatment across participants.

Pilots should prioritise the use of existing data sources where possible, supplementing them with additional indicators only where they demonstrably improve risk assessment.

8.6 Learning, iteration, and scaling

Pilots should be explicitly framed as learning exercises. Outcomes may include:

• refined metrics for emissions and environmental performance;

• improved understanding of how incentives affect behaviour;

• identification of unintended consequences or perverse incentives.

Regular review and iteration allow pilots to evolve, incorporating lessons learned before broader adoption. Successful approaches can then be scaled gradually, either within individual institutions or through wider industry uptake.

8.7 Building momentum through collaboration

Perhaps most importantly, pilots create space for dialogue and trust-building across traditionally siloed communities. By working together on concrete initiatives, insurers, shipowners, financiers, and technical experts can develop a shared understanding of risk and opportunity in a decarbonising shipping sector.

In this way, pilots serve not only as technical experiments, but as catalysts for cultural and institutional change within marine insurance and beyond.

9. Access to Emissions Data as a Foundation for Climate-Informed Underwriting

Across the pathways explored in this paper, access to reliable and comparable emissions and fuel-use data is an important enabling condition. This information need not come from a single source: regulatory reporting, validated third-party modelling and direct data-sharing can all contribute to the evidence base insurers need to assess transition exposure and test differentiated underwriting approaches.

9.1 Why disclosure matters to insurers

Insurance underwriting relies on information symmetry. Insurers price risk based on their ability to assess exposure relative to peers and over time. In the absence of emissions data, climate and transition risks remain opaque, forcing insurers to rely on proxies or assumptions that weaken underwriting precision.

Mandatory emissions disclosure would enable insurers to:

- assess vessel-level and fleet-level exposure to transition risk;
- benchmark performance across comparable vessels and trades;
- track improvement trajectories over time;
- identify concentrations of environmental risk within portfolios.

From a prudential perspective, this enhances risk governance and supports more accurate capital allocation.

9.2 Existing reporting regimes as a foundation

Emissions disclosure in shipping is not a novel concept. Multiple reporting regimes already exist, including international and regional systems that require monitoring, reporting, and verification of fuel use and emissions. These regimes provide a baseline level of data that can be leveraged by insurers without imposing entirely new reporting burdens on operators.

While current systems vary in scope, coverage, and accessibility, they demonstrate that:

- emissions data can be collected at scale;
- verification mechanisms are feasible;
- operators are increasingly familiar with reporting obligations.

Insurers can build on these foundations by aligning underwriting information requirements with existing reporting frameworks, minimising duplication and administrative burden.

9.3 Data requests within the underwriting process

Insurers can incorporate specific emissions and fuel-use information requirements into proposal forms, renewal questionnaires or contractual data-sharing provisions. This approach is preferable to relying on general pre-contractual disclosure doctrines, which vary across legal systems and may create unintended consequences for insured parties if emissions information is treated as material to coverage or claims.

Data requirements should therefore be explicit, proportionate and clearly separated from claims remedies unless a direct connection to the insured risk can be demonstrated. Wherever possible, insurers should rely on existing regulatory or validated third-party data rather than duplicate reporting requirements.

By requiring emissions and fuel-use data as part of insurance contracts, insurers can:

- normalise transparency as a standard business practice;
- improve data quality through repeated reporting cycles;
- signal that environmental performance is materially relevant to risk assessment.

Such requirements need not be punitive. They can

be phased in gradually, prioritising consistency and comparability over immediate completeness. Over time, disclosure expectations can be refined as data systems mature.

9.4 Enabling meaningful underwriting differentiation

Disclosure alone does not change behaviour. However, it is a prerequisite for underwriting tools such as premium differentiation, coverage adjustments, and portfolio-level risk assessment. Without data, these mechanisms cannot function credibly.

Mandatory disclosure enables insurers to move beyond generic assumptions and toward:

- differentiated pricing based on observed performance;
- recognition of improvement and transition efforts;
- informed engagement with insured parties about risk mitigation.

In this sense, disclosure transforms climate and biodiversity considerations from abstract concerns into actionable underwriting inputs.

9.5 Addressing concerns around confidentiality and burden

Concerns about data confidentiality and administrative burden are legitimate and must be addressed. Disclosure requirements should:

- rely on existing data streams wherever possible;
- protect commercially sensitive information;
- ensure proportionality relative to vessel size and operational context.

Clear governance arrangements and standardised formats can help balance transparency with confidentiality, ensuring that disclosure supports risk management without creating undue friction.

9.6 Disclosure as a system-level enabler

Beyond individual underwriting decisions, emissions disclosure has broader system-level benefits. It facilitates alignment between insurance, finance, and policy, enabling coherent signals across the shipping ecosystem. It also supports accountability, allowing stakeholders to assess progress toward decarbonisation objectives.

As expectations around environmental transparency continue to rise, insurers that engage proactively with disclosure are likely to be better positioned to manage regulatory scrutiny and stakeholder expectations.

9.7 From disclosure to transformation

Mandatory emissions disclosure should be understood not as an end in itself, but as the foundation upon which climate-aligned marine insurance can be built. By embedding disclosure into underwriting practice, insurers can unlock the full potential of insurance-based incentives, strengthen risk governance, and contribute meaningfully to the decarbonisation of the shipping sector.



Conclusion

This white paper has examined the role of marine insurance in shaping risk, capital allocation, and operational behaviour in the shipping sector, and has shown that current underwriting practices are increasingly misaligned with the realities of climate change, environmental degradation, and the global transition toward low-carbon transport.

Marine insurance remains heavily oriented toward short-term, vessel-specific financial risk, while largely excluding emissions performance, transition exposure, and climate and biodiversity impacts from underwriting decisions. This gap does not reflect a lack of relevance or feasibility, but rather institutional inertia, structural conservatism, and the absence of shared frameworks for integrating emerging risk categories.

At the same time, the analysis demonstrates that marine insurance represents one of the most immediate and scalable levers available to accelerate shipping decarbonisation. Insurance contracts are renewed annually, underwriting tools are flexible, and insurers already possess mechanisms, such as premium differentiation, coverage conditions, disclosure requirements, all that can be adapted to reflect climate and environmental risk.

Importantly, integrating climate and biodiversity considerations into marine insurance does not require insurers to abandon their core mandate. On the contrary, it strengthens risk governance by ensuring that underwriting reflects foreseeable physical, transition, liability, and reputational risks. When aligned with shipping finance, technical standards, and policy direction, insurance can reinforce decarbonisation incentives and help steer the sector toward a more resilient and sustainable trajectory.

The transition will not be instantaneous or uniform. It will require incremental change, experimentation, and collaboration across the shipping ecosystem. However, delay carries its own risks. Continued underpricing of environmental and transition risk threatens both the long-term stability and viability of insurance portfolios and the credibility of financial institutions operating in an increasingly climate-constrained world.

Recommendations

For marine insurers and P&I Clubs

• Begin integrating climate and transition risk into underwriting frameworks, using existing tools such as premium differentiation, coverage conditions, and portfolio-level assessment.

• Pilot opt-in, benefit-based underwriting approaches that reward improved emissions performance and reduced transition exposure, rather than relying on exclusionary measures.

• Require emissions and fuel-use data disclosure as a condition of insurance coverage, building on existing reporting regimes and phasing requirements over time.

• Collaborate with classification societies and technical experts to validate risk assumptions and normalise low-emission technologies as insurable solutions.

• Develop ESG and biodiversity risk checklists tailored to marine insurance, ensuring consistent internal assessment while retaining underwriter discretion.

For shipping finance institutions

• Align lending criteria with insurance-based risk signals, reinforcing incentives for improved environmental performance across capital and risk markets.

• Engage with insurers on shared metrics and data standards, reducing fragmentation and enhancing the effectiveness of climate-aligned finance.

• Recognise insurance terms as indicators of transition risk, integrating them into credit assessment and portfolio management.

For policymakers and regulators

• Support mandatory emissions disclosure in shipping, ensuring data availability for insurers, financiers, and other risk-bearing institutions.

• Provide regulatory clarity on environmental liability and transition expectations, reducing uncertainty and enabling proactive risk pricing.

• Encourage experimentation and pilot initiatives within the insurance sector by recognising climate-aligned underwriting as a legitimate risk-management practice.

For civil society

• Engage constructively with insurers and financial institutions to co-develop credible, technically grounded solutions.

• Use public accountability strategically, supporting first movers while raising expectations across the sector.

• Translate climate and biodiversity objectives into risk-relevant narratives that resonate with underwriting and financial decision-making.

Final reflections

Marine insurance has long played a quiet but decisive role in enabling global trade. As shipping confronts the defining challenge of decarbonisation, that role must evolve. By integrating climate and biodiversity risk into underwriting practice, insurers can move from passive risk transfer to active risk management,

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