

Reconstructing Corporate Deforestation Liability In The Climate Crisis

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ARTICLE INFORMATION	ABSTRACT
Keywords: Deforestation; Corporate; Climate; Liability; Ecological Restoration.	Deforestation damages ecosystems while releasing stored carbon and reducing future carbon sequestration, creating interconnected harms that challenge conventional environmental liability. The central legal problem is how to connect these consequences to specific corporate actors across direct operations and value chains without treating commercial association as sufficient grounds for liability. This study develops a doctrinal framework that integrates harm characterisation, corporate attribution, and proportionate remedies. It employs qualitative doctrinal analysis of legislation, judgments, advisory opinions, legal scholarship, and published scientific studies, combining conceptual, statutory, and case-law approaches with selective comparison across jurisdictions. The analysis identifies a persistent gap between preventive responsibilities and enforceable liability, compounded by fragmented legal categories, corporate relationships, and evidentiary requirements. It conceptualises forest disturbance as potentially generating dual ecological and climate harm while distinguishing scientific attribution from legal responsibility. The proposed corporate deforestation climate liability framework differentiates direct conduct, involvement through controlled entities, and value-chain relationships, linking each pathway to applicable obligations, causal proof, and attributed consequences. Its remedial approach connects ecological recovery, restoration of carbon-regulating functions, and proven residual harm, with safeguards against double counting and unsupported claims of recovery. The study concludes that integrating harm assessment and remedial design provides a coherent basis for reconstructing liability while preserving jurisdiction-specific legal requirements.

A. INTRODUCTION

Deforestation poses a legal problem whose significance extends beyond the loss of trees or the degradation of a particular site. Tropical forest clearance alters climatic conditions and threatens the ecological processes on which biodiversity, agricultural production, and forest-dependent livelihoods rely. It also affects the carbon balance through emissions from forest disturbance and the removal of vegetation that would otherwise store and sequester carbon (Harris et al., 2021). These connected effects require closer scrutiny of how environmental law characterises forest loss and whether corporate liability can address both identifiable ecosystem damage and its wider climate consequences.

The corporate dimensions of forest loss are particularly difficult to resolve where agricultural production is organised through transnational commodity chains. Research demonstrates the extensive association between tropical deforestation and agricultural

expansion, while distinguishing forest clearance from land subsequently brought into productive use (Pendrill et al., 2022). That distinction matters legally: evidence that a commodity sector drives deforestation does not, by itself, establish the responsibility of every corporation participating in that sector. Transactions linking producers, traders, processors, and buyers must therefore be examined through sufficiently specific information about sourcing and supply-chain relationships, whose opacity can obstruct effective sustainability governance (Gardner et al., 2019).

The resulting research problem concerns the relationship between corporate responsibility, the character of the damage, and the legal conditions for attributing that damage to a particular defendant. Although developed in the human rights context, research on due diligence shows why a company's own operations and its business relationships both matter when identifying and preventing adverse impacts. Preventive responsibility nevertheless needs to be distinguished from civil liability, which depends on the applicable cause of action, a legally recognised duty or other basis of responsibility, and the required connection to harm. Climate litigation has often proceeded through established legal categories rather than an autonomous climate jurisprudence, making the capacity and limits of those categories central to any reconstruction of deforestation liability.

Developments in climate accountability provide a basis for examining this problem without assuming that corporate climate duties operate uniformly across jurisdictions. Recent scholarship examines how mandatory due diligence and climate litigation may interact to address shortcomings in corporate climate accountability (Rajavuori et al., 2023). This analysis directs attention to the relationship between preventive obligations and judicial enforcement, rather than treating disclosure or corporate commitments as substitutes for legally enforceable responsibility. The rights-based development of climate litigation likewise shows how climate concerns can enter existing legal frameworks, although the recognition of such concerns does not dispense with jurisdictional and substantive requirements governing individual claims.

Scholarship on deforestation-free supply chains supplies a complementary account of how corporate conduct can be governed before forest loss occurs. Evaluations of company commitments identify weaknesses in their coverage, implementation deadlines, monitoring, and treatment of gross forest loss. A subsequent review finds that some commodity-specific initiatives have reduced deforestation, while their limited reach and uneven implementation continue to constrain broader effectiveness (Lambin & Furumo, 2023). These studies establish the importance of traceability and credible prevention, but evidence about the effectiveness of supply-chain governance does not itself determine which corporation must answer legally for emissions or lost sequestration resulting from particular forest clearance.

Climate attribution research addresses another part of the problem by examining how emissions can be connected to measurable climatic changes. A quantitative attribution study links emissions traced to major carbon producers to changes in atmospheric carbon dioxide, temperature, and sea level; these findings concern identified carbon producers and cannot simply be transferred to deforestation defendants. Research on the evidentiary foundations of climate litigation further demonstrates the need to distinguish scientific causal evidence from the legal standards through which courts assess responsibility (Stuart-Smith et al., 2021). Read together, these strands of scholarship reveal the integration problem pursued here: the literature reviewed does not sufficiently connect corporate relationships with identifiable forest loss, the combined effects of emissions and diminished sink capacity, and the legal requirements governing liability and remedies.

This article addresses that integration problem by proposing corporate deforestation climate liability, a framework that characterises attributable corporate-linked forest loss as potentially generating dual ecological and climate harm. Its remedial orientation draws on

restoration scholarship that recognises the multiple purposes of forest recovery, including biodiversity conservation, ecosystem services, and climate mitigation (Chazdon & Brancalion, 2019). corporate deforestation climate liability connects that understanding of harm with a differentiated inquiry into contribution, control, knowledge, due diligence, causation, attribution, and economic benefit, without treating commercial association or benefit alone as sufficient grounds for liability. The framework also distinguishes ecological recovery from the reversal of climate consequences, recognising that planting trees is not an uncomplicated substitute for protecting existing forests (Holl & Brancalion, 2020).

Against this background, the study aims to develop a doctrinal framework linking the characterisation of deforestation-related harm, differentiated corporate attribution, and restoration-oriented remedies. It addresses two research questions: first, how can corporate-linked deforestation be reconceptualised from conventional environmental damage into ecological and climate harm? Second, how should corporate liability be reconstructed to address climate harm arising from direct and value-chain-linked deforestation?

B. RESEARCH METHODS

This study adopts a qualitative doctrinal legal research design based on documentary sources, aligning its interpretive analysis with the research questions concerning deforestation-related harm and corporate liability (Creswell, 2009). It examines existing legal principles and their limitations to develop corporate deforestation climate liability as a normative proposal connecting ecological and climate harm, corporate attribution, and legally available remedies (McConville & Chui, 2024). The study combines conceptual, statutory, and case-law approaches to clarify the relationship between legally recognised harm, preventive responsibilities, causal requirements, and remedial obligations. It also draws selectively on European regulatory frameworks, French vigilance legislation, British parent-company jurisprudence, and international climate advisory opinions, comparing their treatment of relevant legal issues while preserving differences in jurisdiction, legal authority, and procedural context (Watkins & Burton, 2025).

The documentary corpus comprises primary legal materials, including legislation, regulations, judgments, and advisory opinions, alongside secondary legal scholarship and published scientific studies concerning forest disturbance, carbon emissions, sequestration, and restoration. Materials are selected for their relevance to the two research questions and their traceable provenance, with official legal texts assessed according to their applicable versions and legal status, and scientific findings used to inform harm characterisation without independently establishing corporate liability. The analysis organises the materials around harm characterisation, corporate involvement, duties and due diligence, causation and attribution, and remedies, using thematic categorisation to support a transparent progression from documentary evidence to analytical conclusions (Miles et al., 2014). It then evaluates the legal conditions identified within each category and synthesises them into corporate deforestation climate liability differentiated corporate pathways and remedial safeguards, distinguishing existing law from the authors' proposed reconstruction and testing each proposition against the scope and limitations of its supporting materials.

C. RESULTS AND DISCUSSION

1. The Limits of Corporate Liability for Deforestation in the Climate Crisis

Conventional environmental liability remains an essential starting point for corporate accountability, but its capacity to address deforestation depends on the damage and obligations recognised by the applicable legal system. The European Environmental Liability Directive, for example, establishes an administrative framework for preventing

and remedying specified environmental damage rather than a general right to private compensation. This distinction matters because a restoration order, an administrative penalty, and an award of civil damages serve different purposes and rest on different legal conditions. A corporation may consequently face measures to repair a damaged forest without being required, through the same proceedings, to answer for its contribution to climatic harm. Corporate accountability is consequently constrained both by the separation of these mechanisms and by persistent weaknesses in environmental enforcement (United Nations Environment Programme, 2023).

The first substantive limitation concerns the legal characterisation of harm rather than the absence of scientific evidence that forests regulate the climate. Under the European framework, environmental damage is organised around protected species and natural habitats, water, and land, with significance assessed against criteria appropriate to those resources (European Commission, 2021). These categories can capture important consequences of forest clearance, yet they do not expressly establish damage to the climate system as an independent protected object. Forest conversion also affects mitigation through the release of stored carbon and changes in the capacity of terrestrial ecosystems to remove carbon dioxide, making the relevant consequences broader than the condition of a particular site. The legal significance of this discrepancy is that a finding of ecological damage may leave the associated loss of carbon storage and sequestration capacity only partially addressed (Intergovernmental Panel on Climate Change [IPCC], 2022).

A related limitation arises from the different timescales of ecological recovery and climate disruption. Research on tropical secondary forests shows that recovery varies markedly across ecosystem attributes, so the return of vegetation cannot be treated as proof that biomass, species composition, and other functions have simultaneously recovered (Poorter et al., 2021). From a climate perspective, the significance of carbon released today must also be evaluated against cumulative emissions and the persistence of warming, rather than solely against projected future uptake by replacement vegetation. Although restoration can contribute to mitigation, its prospective benefits do not establish that the climate effects of earlier emissions have already been reversed (Calvin et al., 2023).

Climate litigation offers an additional route to corporate accountability, but recognition of a general climate-related duty does not settle its content in a particular deforestation claim. In the Shell appeal, the Dutch court recognised an obligation to limit emissions while rejecting the requested reduction order because it could not establish the specific percentage applicable to the company (The Hague Court of Appeal, 2024). For deforestation claims, recognition of the climatic significance of forest loss therefore leaves unresolved the precise conduct required of the defendant and the grounds for the relief sought. Climate due diligence provides a useful conceptual bridge between business responsibilities and climate impacts, but it does not independently resolve the substantive requirements of every cause of action (Macchi, 2021).

Corporate group structures create a further attribution problem because the entity clearing land may differ from the entity directing operations or setting relevant management practices. In *Vedanta*, the possibility of a parent company's duty depended on its own conduct in managing or assuming responsibility for relevant activities, rather than on ownership alone (United Kingdom Supreme Court, 2019). *Okpabi* similarly rejected an unduly restrictive approach to assessing whether a parent had intervened in, or assumed responsibility for, a subsidiary's operations. Both decisions addressed whether claims could proceed and should not be presented as final findings of liability for the alleged environmental damage. In a deforestation dispute, corporate separateness may

therefore be overcome as an obstacle to pursuing a claim without dispensing with proof of the parent's own legally relevant involvement (United Kingdom Supreme Court, 2021).

Attribution becomes more difficult where forest conversion occurs through independent suppliers rather than subsidiaries. Scholarship on mandatory due diligence identifies persistent weaknesses in monitoring, stakeholder participation, and the consequences attached to failures of corporate accountability (Schilling-Vacaflor & Lenschow, 2023). These weaknesses matter where purchasing conditions or sourcing decisions may influence producers while formal contracts allocate operational responsibilities elsewhere. Non-financial due diligence can mobilise supply-chain management and private standards, but its effectiveness depends on the public rules that shape and supervise those processes. The resulting limitation is that commercial influence may be environmentally consequential while remaining difficult to translate into liability, particularly where responsibility is dispersed across contracts and verification arrangements (Partiti, 2021).

The preventive reach of due diligence is broader than a liability inquiry confined to direct operational conduct, as it distinguishes impacts that an enterprise causes, contributes to, or is directly linked to through a business relationship. The OECD Guidelines attach different expectations to these relationships, including the use of leverage, but their recommendations should not be equated with a uniform statutory test for civil liability. Comparative research on France and Germany further shows that mandatory due diligence is shaped by contested legislative choices rather than a single settled model of corporate accountability. The gap lies in the uncertain translation of preventive expectations into enforceable duties owed to identifiable claimants, with different legislative choices producing different routes to accountability (Gustafsson et al., 2023).

Financial relationships expose a similar gap between influence over environmentally harmful activities and a legally sufficient basis for attributing their consequences. Guidance for corporate lending and securities underwriting distinguishes a financial institution's own contribution to an adverse impact from impacts linked to its services through client relationships. This distinction prevents financing from being treated either as automatically irrelevant or as automatically sufficient to establish liability for every activity of the recipient. Scholarship on banks and climate due diligence likewise connects financial decision-making with responsibilities to identify and address climate-related impacts. For deforestation-related harm, the existence of financing consequently leaves unresolved whether the institution's conduct, knowledge, and transaction-specific involvement satisfy the applicable requirements for liability (Macchi & Bernaz, 2021).

Market-access regulation can improve the information available for this inquiry, although compliance mechanisms and compensation for climate harm remain distinct. The EU Deforestation Regulation establishes conditions for covered commodities and products, including deforestation-free production, legality, and due diligence supported by information on production locations (European Parliament & Council of the European Union, 2023). Analysis of the regulation nevertheless identifies continuing tensions in its accountability architecture and implementation, particularly across complex commodity chains. Stronger traceability can thus reduce uncertainty about product origins without independently establishing a defendant's causal contribution to a legally compensable climate injury (Berning & Sotirov, 2023).

The regulatory trajectory also cautions against assuming that mandatory due diligence will develop steadily into comprehensive climate liability. Directive (EU) 2026/470 narrows the corporate sustainability due diligence framework and removes both its mandatory climate-transition-plan obligation and its harmonised conditions for civil

liability, while preserving provisions on compensation where liability arises under national law (European Parliament & Council of the European Union, 2026). As Table 1 shows, these amendments concern adopted legal arrangements whose implementation dates must be distinguished from their enactment. The remaining question is whether due diligence produces enforceable changes in conduct or primarily formal demonstrations of compliance, a concern developed in scholarship on the limits of business authority within mandatory due diligence regimes. The limitation is that mandatory procedures may expand regulatory supervision without necessarily giving affected parties a corresponding, consistently enforceable claim for deforestation-related climate harm (Lichuma, 2024).

Even where an applicable duty can be identified, causation remains a separate and demanding element of corporate deforestation liability. Work linking climate science and legal reasoning shows why probabilistic evidence cannot simply be rejected because an injury has several contributing causes. However, the inference that forest loss contributes to warming must be distinguished from proof that a particular defendant is legally responsible for a claimant's alleged injury. These are distinct evidentiary links: the company's connection to forest clearance, the climatic effects of that clearance, and the relationship between those effects and the injury alleged. Attribution science can inform these links, but the applicable rules on factual causation, legal causation, and the burden of proof determine their significance in litigation (Burger et al., 2020).

Procedural barriers can prevent these substantive questions from being determined, especially where companies, forests, and affected communities are located in different jurisdictions. Climate litigation continues to encounter differences in access to courts, the treatment of claimants, and the legal routes available for challenging climate-related conduct (United Nations Environment Programme & Sabin Center for Climate Change Law, 2025). Jurisdiction, applicable law, access to corporate records, litigation costs, and enforcement abroad can thus constrain a claim independently of its environmental merits. The European Court of Human Rights' climate judgment illustrates the importance of carefully defined standing and positive obligations, but it concerned state responsibility and cannot be transferred directly into a corporate damages action. Recognition of a substantive climate-related obligation therefore remains insufficient where standing restrictions or the absence of an effective forum prevent the claim from being heard (European Court of Human Rights, 2024).

The remedial limitation is equally significant because the adequacy of restoration depends on what the legal order requires it to repair. Contemporary restoration standards emphasise reference conditions, measurable recovery goals, monitoring, and adaptive management, providing a stronger basis for evaluating ecological outcomes than a simple count of trees planted (Gann et al., 2026). Those requirements nevertheless do not themselves determine how a court should address carbon already released or a period of reduced sequestration. Research on restoration priorities also shows that biodiversity protection and carbon benefits vary across locations, undermining any assumption that replacement vegetation elsewhere necessarily reproduces the functions lost at the damaged site. Restoration accordingly presents a problem of remedial equivalence: success against ecological indicators does not necessarily demonstrate that the associated climate consequences have been adequately addressed (Strassburg et al., 2020).

Voluntary carbon offsets do not remove this remedial difficulty because a purchased credit is not, by itself, evidence that an attributable injury has been repaired. An evaluation of forest-conservation projects found substantial problems in the additionality of claimed emissions reductions, demonstrating the importance of credible counterfactual baselines (West et al., 2023). Legal analysis of the voluntary carbon market further identifies

information asymmetries and conflicts of interest that can undermine the quality of credits and the claims made about them. The claimed mitigation value of a credit must also be distinguished from its purchase price and from the separate obligation to restore the damaged ecosystem. The broader limitation is that market certification may support a remedial assessment, but cannot substitute for judicial scrutiny of whether the defendant has met the obligation imposed (Battocletti et al., 2025).

The limits identified above arise from the interaction of legal categories, corporate organisation, evidentiary requirements, and remedial practice, rather than from a single absence of environmental regulation. Recent litigation research records claims concerning damage to the climate system from activities such as illegal deforestation, while also documenting the difficulty of translating climate judgments into effective implementation (Setzer et al., 2025). These developments show that climate consequences can enter legal proceedings, but they do not establish that liability operates consistently across jurisdictions or corporate relationships. Environmental enforcement, market-access controls, and due diligence can each address part of the problem while leaving the allocation of responsibility for particular injuries unresolved. The central finding of this subsection is therefore that the preventive governance of corporate-linked deforestation may extend beyond direct operations, whereas enforceable liability remains dependent on the specific duty, attributable conduct, recognised harm, and remedy available under the governing law.

2. Reconceptualising Corporate Deforestation as Dual Ecological and Climate Harm

Reconceptualising corporate-linked deforestation requires a change in the object of legal analysis, forest loss must be examined through the functions impaired, rather than through the cleared area alone. A necessary starting point is the distinction between deforestation involving conversion to another land use and temporary tree-cover loss or degradation within land that remains forest (Food and Agriculture Organization of the United Nations, 2020). This distinction prevents satellite observations of canopy loss from being treated indiscriminately as evidence of permanent conversion. It also allows the ecological and climatic consequences of a disturbance to be examined without assuming that all forest-loss events have the same cause, duration, or legal significance. Research distinguishing the drivers of global forest loss reinforces the need to identify the particular transformation before characterising the harm associated with corporate activity.

The ecological component of that harm comprises the deterioration of living systems and their capacity to sustain species, habitats, and ecosystem processes. Evidence that primary tropical forests cannot be readily substituted by disturbed forests establishes why the loss of an existing ecosystem is more than the removal of interchangeable vegetation. Fragmentation can further impair connectivity, alter species interactions, and weaken ecological functions even where substantial forest cover remains. These effects support a conception of ecological injury that includes changes in ecosystem condition and organisation, rather than only the immediate destruction of trees.

Hydrological and thermal functions reveal why ecological and climate harm cannot be separated exclusively by geographical scale. Forests influence evapotranspiration, atmospheric moisture, water availability, and surface cooling, linking ecosystem processes with climatic conditions experienced by surrounding communities. Their disruption may therefore affect both the functioning of the forest landscape and the environmental conditions beyond its boundaries. The relationship also means that carbon dioxide emissions do not exhaust the climatic significance of deforestation, although biophysical effects vary with location and must be assessed in context. For legal

characterisation, the two dimensions are distinguished by the functions and interests impaired, while recognising that changes in water and energy exchanges can operate across both dimensions (Lawrence et al., 2022).

The first carbon-related mechanism is the release of carbon previously held in forest biomass and, where affected, soils. Research on tropical forest carbon gains and losses demonstrates that disturbance can alter the balance between carbon uptake and release, making loss of stored carbon an identifiable component of climatic change. Burning, decomposition, and changes in land management can produce different emissions profiles, so the amount and timing of release require evidence about the affected carbon pools and subsequent land use. The ecological destruction of biomass and the atmospheric consequences of its carbon release are thus linked effects of the same disturbance, rather than mutually exclusive descriptions of injury. Evidence of substantial emissions from tropical forest degradation additionally shows that carbon-related harm may arise without complete conversion of the affected land.

The second carbon-related mechanism concerns diminished capacity to remove carbon dioxide that would otherwise remain in the atmosphere. Measurements establishing the importance of forests as carbon sinks provide a basis for distinguishing this continuing function from the stock of carbon already stored in vegetation and soils. Forest loss can impair both functions, but the reduction in future removals is a counterfactual difference between the disturbed landscape and a defensible trajectory without the relevant disturbance. That trajectory cannot presume an unchanged or indefinitely increasing sink, because forest growth, mortality, environmental conditions, and prior disturbance affect subsequent uptake. Evidence of changing sink dynamics across African and Amazonian tropical forests supports a context-sensitive assessment of foregone sequestration rather than a uniform assumption about future carbon absorption (Hubau et al., 2020).

The relationship between these mechanisms is cumulative, but their measurement must remain internally consistent. Regional research in Amazonia connects carbon-source behaviour with deforestation and climatic conditions, demonstrating the interaction of land disturbance, fire, warming, and ecosystem stress within a particular geographical setting (Gatti et al., 2021). Such evidence supports the coexistence of ecological deterioration and climate-relevant carbon effects without establishing that every forest or every clearance event has an identical net effect. Carbon accounting must accordingly identify the baseline, relevant pools, assessment period, and treatment of regrowth before combining emissions with changes in removals. The proposed dual characterisation recognises both mechanisms while avoiding a second count of carbon consequences already incorporated in a net land-use flux estimate (Friedlingstein et al., 2023).

The legal significance of these connected effects lies in their potential to impair several protected interests through a common disturbance. Recognition of the human right to a clean, healthy and sustainable environment provides an international normative basis for considering environmental quality and human well-being together, although the General Assembly resolution does not itself establish a universal corporate cause of action (United Nations General Assembly, 2022). Ecological injury may concern habitat integrity, water, soils, and forest-dependent livelihoods, while climatic consequences may affect interests exposed to warming and altered environmental conditions. Rights-based climate scholarship illustrates how such consequences can be articulated through existing legal interests, while also revealing the diversity of claims that accompany the climate emergency. Dual harm is therefore proposed here as a way of identifying the interests and

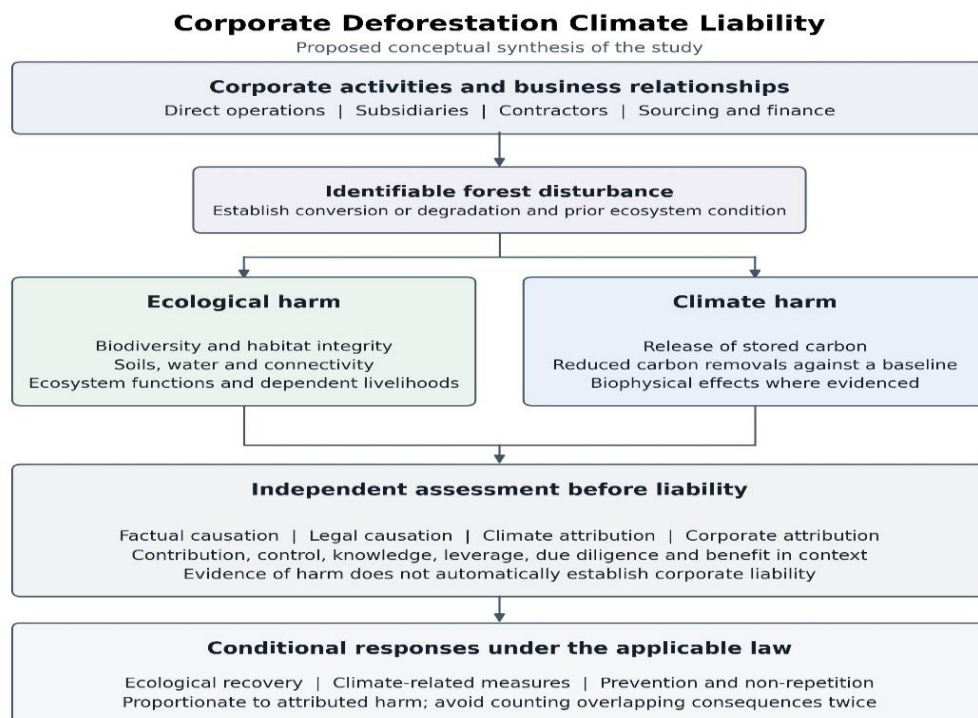
consequences requiring legal examination, rather than as a presumption that scientific disturbance automatically constitutes an actionable injury (Savaresi & Setzer, 2022).

The corporate dimension must be added to this characterisation without changing the physical nature of the underlying harm. The distinction between impacts caused, contributed to, or linked through business relationships supplies a vocabulary for examining corporate connections to adverse consequences. Direct operations, subsidiary activities, contracting arrangements, and sourcing relationships may connect a corporation to forest disturbance through different forms of conduct or involvement. The proposed analysis therefore keeps the identification of dual harm separate from the legal determination of corporate responsibility, consistent with scholarship distinguishing due diligence responsibilities from the conditions of civil liability (Bueno & Bright, 2020).

Figure 1 presents the study's proposed conceptual synthesis, locating dual harm between identifiable forest disturbance and the subsequent assessment of corporate responsibility. Its climate branch distinguishes changes in stored carbon from changes in continuing sequestration, reflecting the separate treatment of carbon pools and fluxes in established inventory methods. Its ecological branch retains biodiversity, habitat integrity, soils, water, and ecosystem functions as objects of examination in their own right. The figure then places the characterisation of harm within the broader Corporate Deforestation Climate Liability framework, showing how causal and corporate assessment condition any response rather than follow automatically from commercial involvement. Forest recovery may support both ecological functions and carbon removal, but the model preserves these distinct objectives instead of treating an increase in tree cover as a complete account of either outcome (Lewis et al., 2019).

Figure 1. *Corporate Deforestation Climate Liability: Proposed conceptual synthesis.*

Source: Author's conceptual synthesis of the scientific and legal materials discussed in



this subsection and the corporate deforestation climate liability proposal. Arrows indicate analytical relationships, not automatic legal liability.

The figure makes the relationship between integration and analytical separation explicit. Research on nature-based solutions shows that climate and biodiversity objectives can reinforce one another, but can also diverge when mitigation favours interventions with limited ecological value (Seddon et al., 2020). Accordingly, the paired harm branches converge for legal assessment without collapsing ecological condition into a carbon metric or replacing climate effects with a general statement of environmental degradation. The lower part of the figure identifies possible responses only where responsibility is established under the applicable law, distinguishing ecological recovery, climate-related measures, and prevention while requiring attention to overlapping benefits. These responses are elements of the proposed framework, whose adequacy depends on the consequences addressed and the feasibility, costs, and side effects of the measures selected.

In answer to the first research question, corporate-linked deforestation can be reconceptualised as a disturbance that potentially impairs two interdependent domains: ecosystem integrity and climate-regulating functions. The Kunming-Montreal Global Biodiversity Framework recognises the relationship between biodiversity and climate action while emphasising safeguards for biodiversity, supporting an integrated approach that preserves the distinct environmental interests involved (Conference of the Parties to the Convention on Biological Diversity, 2022). On this basis, the article proposes the Dual Harm Doctrine as an analytical proposition within corporate deforestation climate liability, rather than an already settled doctrine of positive law. Its substantive contribution is to identify ecological deterioration, attributable carbon release, and evidenced loss of sequestration capacity within one account of forest disturbance, while reserving actionable harm and corporate liability for separate legal determination.

3. Reconstructing Corporate Deforestation Climate Liability

Corporate deforestation climate liability is proposed here as a sequence of legal determinations connecting corporate conduct, dual harm, and an enforceable response. Scholarship on the expansion of corporate duties of care provides a basis for examining climate-related responsibilities through established legal categories, without assuming that every environmentally consequential business relationship creates a duty (Palombo, 2024). The framework's novelty lies in combining differentiated corporate pathways with an evidence-based allocation of ecological and climate consequences within a single remedial inquiry. Its contribution is therefore an operational reconstruction of the relationship between responsibility and repair, rather than the assertion of a universally applicable new cause of action. Experience with the French duty of vigilance reinforces the need to specify the conditions through which preventive obligations become judicially enforceable, instead of treating the adoption of a corporate plan as equivalent to effective accountability (Savourey & Brabant, 2021).

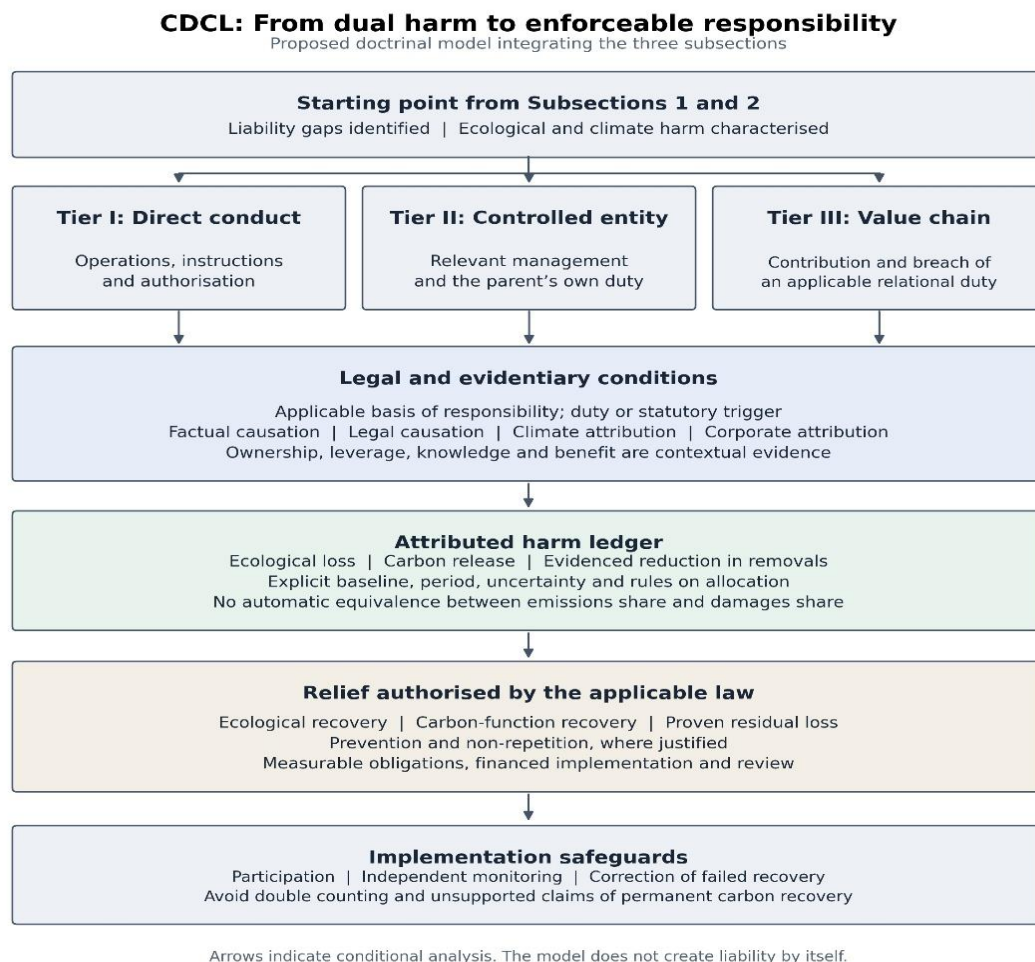
Tier I addresses forest disturbance undertaken, directed, or authorised through the corporation's own operations. Evidence should connect the relevant entity to a specified location, period, and activity through operational records, land-use decisions, contracting instructions, or comparable material, building on the risk-identification practices recommended for agricultural supply chains. Such evidence establishes the operational pathway but still requires assessment against the applicable prohibition, duty, or statutory basis of liability. Permission to operate cannot be treated as proof that every resulting consequence has been legally authorised, just as a breach of a preventive obligation does not necessarily prove the full loss claimed.

Tier II concerns conduct associated with a subsidiary or another controlled entity, but ownership should identify a relationship for investigation rather than determine liability. The inquiry should examine whether the parent directed forest-related decisions, undertook relevant supervision, or breached an independently applicable obligation concerning the controlled activity. A subsidiary's separate personality and the parent's own wrongful conduct must therefore be analysed together, without presuming that either ownership or formal delegation conclusively resolves the claim. The proposed tier preserves this distinction by allocating responsibility through a demonstrated legal basis and causal involvement, consistent with scholarship examining alternatives to indiscriminate corporate-group liability.

Tier III addresses independent suppliers, contractors, buyers, and financial relationships where the defendant's conduct is more remote from physical clearance. Evidence from corporate supply-chain practices supports a contextual standard of reasonable due diligence, including inquiry into the information available and the preventive measures feasible in the relevant relationship (Smit et al., 2021). Under corporate deforestation climate liability, purchasing incentives, operational instructions, continued transactions despite substantiated warnings, or failures to take required precautions may support attribution when connected to forest disturbance through the applicable legal test. Commercial benefit or contractual leverage alone remains insufficient, and the three tiers describe pathways of involvement rather than an automatic ranking of monetary liability. This tier also requires scrutiny of verification practices, because research on ethical auditing shows why certification and audit procedures cannot simply be accepted as reliable proof that an enterprise has prevented adverse impacts.

The sequence summarised in Figure 2 requires each pathway to pass through four distinguishable evidentiary inquiries: factual causation, legal causation, climate attribution, and corporate attribution. Research tracing historical emissions to identified producers demonstrates the importance of transparent source records and consistent allocation boundaries, although its fossil-fuel methodology cannot be transferred unchanged to forest-loss claims. Factual causation connects corporate conduct to forest disturbance, legal causation assesses the connection required by the cause of action, and climate attribution examines the climatic consequences supported by the emissions and sink evidence. Corporate attribution then identifies which defendant bears responsibility under the relevant rule, with uncertainty disclosed at each stage rather than concealed within a single estimate. End-to-end climate attribution illustrates how successive links can be investigated scientifically, but its findings for carbon majors neither establish liability for deforestation defendants nor remove the need to prove the injury and legal connection alleged in a particular claim (Callahan & Mankin, 2025).

Figure 2. *corporate deforestation climate liability (CDCL) as a conditional architecture of responsibility and repair.*



Source: Author's doctrinal synthesis of the three subsections. Implementation safeguards are informed by restoration standards (Nelson et al., *Standards of Practice to Guide Ecosystem Restoration*, 2024). These standards support restoration practice and do not establish the proposed corporate liability tiers. Official source: <https://doi.org/10.4060/cc9106en>

Figure 2 shows how corporate deforestation climate liability translates the dual-harm characterisation into an evidentiary ledger for allocating consequences and designing relief. Research tracing deforestation emissions through agricultural and forestry trade provides information about embodied emissions, while demonstrating why an accounting allocation to traded commodities must be distinguished from a legal finding against a specific enterprise. The proposed ledger records ecosystem damage, released carbon, and evidenced reductions in future removals against explicit spatial, temporal, and counterfactual boundaries. It must distinguish gross losses from net changes and identify overlapping estimates before calculating the consequences attributed to a defendant. Allocation must follow the applicable rules on divisibility and joint responsibility, because an accounting share of emissions is not automatically a share of recoverable damages. Findings from the Brazilian Amazon, where degradation and conversion produced different patterns of carbon loss, reinforce the need to base this ledger on the

disturbance and biomass evidence rather than infer a uniform emissions quantity from the area cleared (Qin et al., 2021).

The remedial stage begins by specifying the ecological condition to be recovered and the defendant's legally established obligations concerning that recovery. Restoration standards support the use of reference ecosystems, measurable objectives, stakeholder engagement, and monitoring, providing a practical basis for orders that require demonstrated recovery rather than the completion of planting activities alone. Where the applicable law permits, an order should identify implementation responsibilities, financing arrangements, review intervals, and corrective action when the agreed trajectory is not achieved. Local and Indigenous interests must inform design and implementation, because repair cannot be evaluated solely through vegetation cover or a corporate declaration of completion. Evidence of trade-offs among forest restoration approaches supports this differentiated assessment, particularly where plantations deliver production benefits without recovering the biodiversity and ecosystem services associated with native forests (Hua et al., 2022).

The remedial rules summarised in Table 1 require climate-related relief to address attributed consequences, with carbon recovery assessed alongside its durability and ecological effects. Research on climate-driven risks to forest mitigation demonstrates why projected sequestration requires attention to drought, fire, mortality, and other disturbances, rather than being accepted as a guaranteed reversal of historical emissions (Anderegg et al., 2020). Corporate deforestation climate liability therefore proposes monitored restoration of carbon-regulating functions, additional preventive measures, and compensation for proven residual loss where the applicable law authorises these responses. A common accounting boundary must identify benefits shared by ecological and climate measures so that an integrated order does not compensate the same consequence twice or claim future uptake as already achieved. Evidence of weaknesses in California's forest-offset buffer system supplies a specific warning about permanence safeguards, supporting scrutiny of offset-based proposals without assuming that every offset programme has the same defects (Badgley et al., 2022).

Table 1. *Operational rules and safeguards proposed under corporate deforestation climate liability.*

Module	Proposed rule	Evidence or implementation requirement	Boundary against overreach
Tier I Direct conduct	Examine the corporation's own clearing, direction or authorisation.	Site and date; operational decisions; land-use and contracting records.	Operational involvement still requires an applicable legal basis.
Tier II Controlled entity	Examine relevant management and breach of the parent's own duty.	Decision authority; supervision; undertakings; measures required.	Ownership alone is insufficient; formal delegation is not conclusive.
Tier III Value chain	Examine contribution and breach under the applicable relational duty.	Sourcing or finance terms; warnings; feasible precautions; conduct linked to loss.	Benefit, leverage and an audit report do not independently decide liability.
Attribution Across all tiers	Establish the required causal links and the defendant's legal responsibility.	Source records; scientific attribution; uncertainty; jurisdiction-specific tests.	Scientific allocation is distinct from legal allocation of damages.
Dual harm ledger	Record ecological loss and climate consequences within consistent boundaries.	Baseline; period; carbon pools and fluxes; regrowth; overlap and allocation.	Avoid combining incompatible estimates or counting the same loss twice.
Remedies and review	Order authorised, proportionate relief with measurable recovery obligations.	Financing; participation; monitoring; review and corrective action.	Planting or credits alone do not prove ecological or durable climate repair.

Author's proposed rules; supporting restoration principles are identified in the source note accompanying the table.

Source: Author's proposed allocation rules. The remedial orientation is informed by the UN Decade restoration principles (United Nations Environment Programme & Food and Agriculture Organization of the United Nations, 2021). The principles are guidance, not a source of corporate civil liability. Official source: <https://wedocs.unep.org/handle/20.500.11822/40470>

Table 1 consolidates the proposed rules by showing how each corporate pathway leads to a distinct evidentiary inquiry while retaining common safeguards for attribution and remedies. The 2024 law-of-the-sea advisory opinion explains the importance of regulation, supervision, and enforcement in state due diligence concerning greenhouse-gas pollution, providing an international context for preventive governance rather than a direct judgment of corporate liability (International Tribunal for the Law of the Sea, 2024). Read alongside Figure 2, the table identifies corporate deforestation climate liability's distinctive contribution: the corporate pathway determines the evidence sought, the proven causal links delimit the harm attributed, and the resulting allocation guides monitored relief. This reconstruction answers the second research question by connecting responsibility across direct and relational deforestation with proportionate repair, while remaining a doctrinal proposal requiring evaluation within particular legal systems. The 2025 climate advisory opinion situates that proposal within states' obligations to address climate harm and regulate relevant private conduct, without replacing the domestic legal conditions through which an individual corporation may be held liable (International Court of Justice, 2025).

The central argument advanced by the authors is that corporate deforestation liability should follow the consequences of corporate conduct across both ecological and climate dimensions, while retaining the legal conditions that make responsibility attributable to a particular defendant. Within corporate deforestation climate liability, the appropriate unit of assessment is the legally attributable disturbance and its evidenced consequences, assessed together across the corporate pathway through which the disturbance occurred. This approach gives restoration a continuing legal significance: remedial performance should be evaluated against demonstrated recovery and the treatment of residual harm, rather than discharged solely by completing prescribed activities. The authors therefore propose that future legislative and judicial development of deforestation liability should require reasoned findings on the connection between conduct and harm and, where legally authorised, reviewable obligations that remain responsive to ecological recovery and the persistence of climate consequences.

D. CONCLUSION

This study concludes that deforestation associated with corporate activities can be conceptualised as interconnected ecological and climate harm, encompassing diminished ecosystem integrity, carbon release, and demonstrable reductions in carbon sequestration capacity. This characterisation provides a basis for reconstructing liability through the corporate deforestation climate liability framework, which connects forms of corporate involvement, the basis of legal obligations, proof of causation, attribution of harm, and proportionate remedies. Ownership relationships, commercial connections, and economic benefits are relevant to the inquiry but do not independently establish liability. The study's principal contribution lies in integrating harm assessment and remedial design within a doctrinal framework that preserves the legal requirements for imposing liability on a particular corporation.

Theoretically, the framework extends environmental liability analysis by bringing ecosystem damage and climate consequences within a single inquiry while preserving distinctions between the interests protected and their evidentiary requirements. Its practical implication is the provision of an analytical sequence for assessing corporate involvement through direct operations, controlled entities, and value-chain relationships under the applicable law. The framework also clarifies that compliance with preventive procedures and successful restoration require separate assessments. Accordingly, the adequacy of remedial measures can be evaluated against the recovery of ecological and climate-regulating functions and the treatment of proven residual harm, with attention to the durability of outcomes and the potential for double counting.

This study is limited to doctrinal analysis of documentary materials and selective comparison across jurisdictions; it has therefore not tested the proposed framework in a particular deforestation dispute or assessed the effectiveness of remedial implementation. Its reliance on published scientific findings has also precluded independent quantification of emissions and lost carbon sequestration capacity attributable to a particular corporation.

E. RECOMMENDATIONS

Future research could test the framework through case studies connecting corporate operational records, evidence of forest change, and the requirements of causation within a single jurisdiction. Evaluation of the implementation of judgments or remedial obligations could then assess the feasibility of indicators, access to evidence, and review mechanisms, enabling the framework's application to be assessed against measurable restoration outcomes.

DECLARATIONS

1 Author Contributions

Author One: Conceptualization, methodology, data analysis, and manuscript writing.
Author Two: Data collection, analysis, and manuscript revision.
Author Three: Supervision, validation, and final approval of the manuscript.

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3 Conflict of Interest

The authors declare that there is no conflict of interest related to this research.

4 Ethical Approval

Ethical approval was not applicable to this study.

5 Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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