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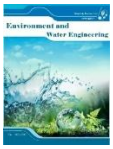

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Hybrid environmental liability in Jordan: Reforming fault-based civil liability through risk-based approaches

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ABSTRACT

The core of the problem lies in the fact that environmental damage poses the greatest challenge to fault-based liability systems. On the other hand, it also offers the best opportunity to develop strict liability or no-fault systems. This paper examines and evaluates the ability of Jordan's current civil liability system to address environmental damage and assesses a hybrid liability model as a basis for reform. It employs doctrinal and comparative legal research methods. The relevant laws and regulations examined include the Jordanian Civil Code, the Environmental Protection Law No. 6 of 2017, and selected European and French models of environmental liability. One of the major findings is the significant gap between public environmental regulation and private compensation mechanisms in Jordan. The requirements of fault, damage, and causation for obtaining civil remedies often result in gaps in addressing cumulative, scientifically uncertain, ecological, or hazardous environmental harm. The law has not yet recognized ecological damage as an independent legal interest and continues to rely on monetary compensation. This article proposes adapting a hybrid model of environmental liability within Jordanian civil law, including fault-based compensation, targeted risk-based liability, recognition of ecological damage, evidentiary adjustments, and restorative remedies within a unified reform framework. The proposed model retains fault-based liability for civil damage, introduces risk-based liability for hazardous activities, and incorporates evidentiary standards adjusted under the polluter-pays principle, ecological damage, restorative remedies, and an environmental compensation fund. The proposed model presents a balanced approach that would promote fairness and deterrence, strengthened prevention, enhance compensation, and support the effective restoration of the environment.

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1. Introduction

Environmental pollution is a major challenge for legal and regulatory systems across the world. The growth of industry, urbanization, and the development of new technologies have brought about problems such as air and water pollution, challenges in waste management, and global warming. Unlike typical civil injuries, environmental harm can be widespread, long-term, and scientifically uncertain, affecting future generations and ecosystems (Vinuales, 2021). Furthermore, environmental pollution can be caused by waste disposal, plastic pollution, and the destruction of aquatic ecosystems, indicating that much environmental damage is ecological, cumulative, and hard to attribute to individual loss (Asefi & Attaran-Fariman, 2022; Behmanesh et al., 2024).

These factors make it difficult for the traditional civil liability system to assign responsibility and resolve cases; as a result, many countries are shifting away from fault-based liability in environmental law. Today, risk-based approaches such as

strict liability, the polluter-pays principle, and preventive or restorative measures are more widely used. This shift is important in Jordan because environmental damage is still primarily addressed under general civil liability law rather than through a separate environmental liability system.

The two primary purposes of civil liability are to compensate parties harmed by others and to hold those who injure others accountable for their behavior, thereby setting appropriate standards of conduct. The Jordanian Civil Code provides that tort liability in environmental cases are based on three essential components: fault, damage and causation (Jordanian Civil Code, 1976). This reflects the corrective justice principle, which holds that compensation is awarded for environmental harm caused by another party's wrongful conduct (Alkseilat et al., 2020; Fatima et al., 2025). While the traditional tort system is typically effective in civil matters involving distinct groups of plaintiffs with identifiable injuries and direct connections between the defendant and the plaintiff, its application in the environmental context has raised questions regarding its adequacy (Alshible et al., 2023). Environmental pollution is produced by many complex manufacturing processes that involve an infinite variety of continuous emissions into the environment from numerous defendants at various points in time, combined with scientific uncertainty regarding the cause of any emission (Al-Hammouri et al., 2023a). Consequently, the conventional fault-based system for tortious conduct has proven inadequate in providing plaintiffs with compensation or deterring future violators (Alsharqawi et al., 2026).

Environmental liability systems have increasingly moved from purely fault-based liability toward risk-based approaches that allocate environmental costs to those who create or control environmental risks. This shift is reflected in strict liability for hazardous activities and the polluter-pays principle, both of which aim to internalize environmental costs and encourage prevention and remediation (Faure & Partain, 2019; European Commission, 2023).

Jordanian law primarily applies general civil liability rules to resolve cases involving environmental damage, even though many countries have shifted toward risk-based environmental liability over the past few decades. Although the Jordanian Environmental Protection Law No. 6 of 2017 establishes a fundamental framework for protecting the environment, it does not create a comprehensive civil liability framework governing environmental damage. Therefore, claims arising from pollution and other environmental harm continue to be resolved through the general provisions of the Jordanian Civil Code, specifically by requiring proof of fault, damage to property, and causation. As a result, this creates a disconnect between the way in which modern forms of environmental harm and the legal framework available to remedy them. This issue is especially evident in cases involving industrial pollution, collective harm, scientific uncertainty and long-term ecological damage, where traditional fault-based requirements either do not allow for recovery or do not provide sufficient deterrent to prevent further harm (Manasra et al., 2022).

This article examines whether the traditional fault-based civil liability system in Jordan can remain effective in addressing environmental pollution. It argues that reform requires consideration of modern risk-based methods, such as strict liability and hybrid environmental liability, as possible reform alternatives. The article explains that the existing civil liability framework is based on tort law and is ill-suited to environmental claims, particularly in terms of causation, evidence of ecological damage, and remedies. It also highlights gaps in the current framework. The article recommends a hybrid model of environmental liability for Jordan, combining tort law for ordinary harm with risk-based liability for hazardous activities. Such as model would strengthen compensation, deterrence, prevention, and environmental rehabilitation.

2. Methodology

This study combines doctrinal and comparative legal methodologies. Specifically, it examines the legal rules that shape civil liability for environmental damage in Jordan. This is achieved through an analysis of the provisions of the Jordanian Civil Code (No. 43 of 1976) and the Environmental Protection Law (No. 6 of 2017). This reveals how more conventional aspects of fault and damage become clear when applied to environmental cases, in contrast to normal civil torts. The doctrinal method forms the primary methodological approach because it enables a detailed and systematic rule-based, review of statutes, principles, and judicial decisions (Hutchinson & Duncan, 2012).

The comparative analysis emphasizes European and French models, as they offer well-developed framework concerning polluter-pays liability, ecological damage, preventive remedies, and restoration-based approaches that are relevant to Jordan's civil-law system principles, which may be integrated into Jordanian civil law by considering judicial capacity and regulatory context through comparative legal reasoning (Van Hoecke, 2011).

The Selection of sources is based on their relevance to the study of fault-based civil liability in Jordan, with special reference to the features of environmental damage and the potential application of risk-based liability as a reform model. The study primarily examines statutes, and case law with academic literature on environmental liability, tort law, and comparative legal methodology. This approach provides a legally grounded assessment of whether Jordan should adopt a hybrid model that integrates fault-based liability with risk-based protection.

3. Literature Review

Concerns about environmental damage are prompting questions about whether fault-based liability is an appropriate model for contemporary environmental hazards and their consequences. Supporters of the fault-based liability model argue that it provides a predictable and consistent method for establishing liability by requiring proof of fault, actual

damage, and causation before compensation can be awarded (Wissink, 2004; Manasra et al., 2022). Such case, the defendant will only be held responsible for conduct that has been determined to be morally or legally wrongful, and only to the extent of the damage incurred. Therefore, this approach provides significant protection to parties who might otherwise be held liable for damages without sufficient legal justification and prevents unjust liability from being imposed on parties who are not responsible for actions that result in environmental harm. Despite these shortcomings, many environmental laws scholars express concern about how well this model will resolve issues such as pervasive pollution, cumulative harm, insufficient scientific information, and multi-party cases. As a result, fairness protections associated with the traditional tort system may create barriers to obtaining compensation for damage caused by harmful acts, deterring harmful conduct, and impede environmental restoration (Bell et al., 2024).

Another significant issue in the literature on environmental liability claims is the evidentiary burden required to prove a claim. Establishing a causal link between a defendant's conduct and the resulting environmental damage is difficult due to the cumulative and delayed nature of environmental harm and the scientific complexity involved. Fisher et al. (2009) contend that scientific uncertainty is a dominant issue in environmental disputes because various natural, industrial, and human factors can cause similar environmental damage. The environmental litigation literature supports the view that this issue is not merely a theoretical concern; courts are increasingly called upon to evaluate conflicting expert testimony and determine which party is responsible for pollution that is both difficult to pinpoint and for which sufficient evidence to establish a causal connection is lacking (Bertram, 2021). Under the fault-based approach, the plaintiff must prove causation according to the usual civil burden of proof. However, from a risk-based perspective, this burden of proof may be unrealistic, when the harm is spread across several locations, is scientifically complex, or is caused by multiple parties. This is why there is an increasing number of studies on environmental liability that support evidence-based adaptations, such as presumptions of causation, reliance on expert evidence, and shifting the burden of proof where appropriate under specified circumstances (Faure & Partain, 2019).

A large body of research on the law's role in addressing evidentiary and remedial problems has contributed to increased interest in risk-based liability models, particularly strict liability, as a complement to or alternative to traditional fault-based liability. Under strict liability, liability is imposed primarily based on the existence of hazardous environmental risks arising from activities that create or control environmental risk. The rationale for this approach is that those who derive economic benefit from risk-producing activities should bear responsibility for the costs of preventing, mitigating, and repairing any resulting environmental harm (Bell et al., 2017; Zhai, 2022). The use of strict liability also closely aligns with the polluter-pays principle, which seeks to ensure that the costs of environmental degradation are not borne by victims, the public, or the government (European Commission, 2023).

The central doctrinal debate concerns not the distinction between strict and fault-based liability, but rather the three theoretical approaches that seek to justify liability rules. The first, the corrective justice approach, supports fault-based liability on the grounds that liability should be imposed only when the claimant establishes fault, damage, and causation. This approach upholds legal certainty and prevents defendants from being held liable for harm they did not wrongfully cause (Wissink, 2004; Weinrib, 2012). Its principal strength lies in its fairness to individual defendants. However, it presumes that harm, fault, and causation can be clearly identified, which is frequently not the case in environmental pollution cases.

The second approach focuses on economic efficiency. It supports strict or risk-based liability because, the party who creates or controls environmental risk is generally in the best position to prevent harm, control emissions levels, obtain insurance against environmental risk, and internalize the environmental costs associated with those risks (Faure & Partain, 2019). From this perspective, strict liability enhances deterrence and is therefore more likely to lead to safer industrial practices. This approach also has limits. If the standard of strict liability is set too broadly, compliance costs, as well as insurance and litigation costs, will increase, particularly for inadequately defined hazardous activities and in situations where standards of causation are ambiguous (Cosnita-Langlais & Langlais, 2024).

The third approach, environmental protection, has little to do with the morality of the defendant. Instead, it focuses on environmental protection, the restoration of ecological damage, and the prevention of future environmental harm. The approach is based on principles, such as ecological damage, restorative remedies, the polluter-pays principle, and adjusted evidentiary rules (European Parliament & Council, 2004; Zhai, 2022; Song et al., 2024; Zhou et al., 2023). The primary advantage of this approach is that it reflects the collective and ecological characteristics of pollution. Like the other two approaches, however, it must be carefully adapted to national legal systems to avoid uncertainty and excessive institutional burdens.

None of the approaches outlined above is adequate for Jordan when taken in isolation. Fault-based liability, however, has the advantages of compensating victims and ensuring legal certainty. From an economic perspective, the least cost avoider will be motivated to take efficient precautions. This is particularly important in environmental protection, where it is much better directed at ecological damage. A hybrid model may be the best solution for Jordan. This model would apply fault-based liability to ordinary civil claims and strict or risk-based liability to hazardous activities and major environmental damage. It would also include evidentiary adjustments, the recognition of ecological damage, and the provision of

restorative remedies. Such an approach would reconcile competing doctrinal perspectives in literature. It would maintain legal certainty while also promoting environmental protection and effective compensation (Bennett et al., 2023; Dong et al., 2023; Du & Sun, 2023).

In the Jordanian context, the existing scholarship primarily outlines the Environmental Protection Law and the general civil liability provisions of the Jordanian Civil Code, without a critical evaluation of their effectiveness in addressing contemporary environmental harm. The scholarship indicates that the general principles of tort—fault, damage, and causation—remain applicable to cases of environmental pollution in Jordanian law (Alkhseilat et al., 2022; Soltani, 2024). Little attention, however, has been paid to the application of these principles in cases of collective, scientific uncertainty, long-term environmental harm, or ecological harm. Accordingly, this paper identifies an important analytical gap concerning whether the existing civil liability framework in Jordan can effectively address industrial pollution and ecological damage characterized by complex causation, or whether a hybrid model of fault- and risk-based liability would offer a more coherent basis for reform (Manasra et al., 2022).

4. Research Gap

Although comparative scholarship focuses on environmental liability, strict liability, ecological damage, and the polluter-pays principle, their applicability in the Jordanian context is underdeveloped. Most studies in Jordan have focused primarily on the Environmental Protection Law No. 6 of 2017 and the general civil liability provisions of the Jordanian Civil Code. Little, if any, attention has been paid to whether the traditional requirements of fault, damage, and causation are sufficient to address scientifically uncertain, cumulative, collective, or ecological pollution (Al-Hammouri & Al-Billeh, 2023b). Comparative literature has developed the concepts of strict liability, ecological damage, preventive remedies, and restoration-based liability, but their adaption to Jordan's civil-law framework, institutional capacity, and regulatory structure remains underdeveloped. (Zhai, 2022; Al-Hammouri et al., 2023c).

This study fills this gap by proposing a hybrid model designed specifically for Jordan's civil-law framework rather than merely importing comparative strict-liability rules. Its novelty lies in combining fault-based liability, targeted risk-based liability, evidentiary adjustments, ecological damage, and restorative remedies within a single reform model adapted to Jordanian courts and regulatory capacity. This approach is justified because environmental litigation is often characterized by scientific uncertainty, technical complexity, and difficulties in establishing causation (Al-Khawaldah et al., 2023; Bertram, 2021). Accordingly, the proposed model aims to enhance compensation, deterrence, prevention, and environmental remediation in Jordan through doctrinal analysis, comparative legal reasoning, and practical legislative proposals.

5. Theoretical Framework: Fault-Based Liability vs Risk-Based Theories

This section compares fault-based and risk-based liability theories to determine the adequacy of Jordan's civil liability rules for environmental litigation. Fault-based liability is grounded in the concept of corrective justice and requires proof of fault, damage, and causation. Risk-based liability, on the other hand, allocates environmental costs to the parties that create, control, or benefit from hazardous activities (Al-Dlabeeh & Alsharqawi, 2023; Ndububa, 2025). This analytical framework examines whether a hybrid model can more effectively address issues of culpability, causation, cumulative pollution, compensation, prevention, and environmental restoration in Jordan (Pihalehto & Puharinen, 2024).

5.1. Fault-Based Liability Theory

Many jurisdictions, including Jordan, define civil liability on a fault basis. Liability is usually established by proving fault, damage and causation. Traditionally, this form of liability is justified on corrective justice grounds, which provides a mechanism for restoring the legal balance disrupted by the wrongful act and for ensuring that liability is assigned only to the defendant whose wrongdoing caused the damage. (Wissink, 2004).

The theory behind fault-based liability is that it provides both legal certainty and fairness, since it protects against arbitrary liability by preventing an individual from being held liable for damages unless there is a sufficiently close connection between conduct and the resulting harm. Fault-based liability also has relevance for how private law liability relates to the principle that an injured party is entitled to compensation when another party breaches a legally recognized standard of care (Weinrib, 2012). This rationale supports the continued use of fault-based liability in resolving ordinary civil disputes, particularly when there is clear evidence of an identifiable injured party, direct injury, and a demonstrable causal link between the defendant's conduct and the resulting harm.

Due to practical constraints, the effectiveness of this theory is illustrated using examples from environmental litigation. Such litigation may arise from environmental harm caused by lawful industrial activities, cumulative emissions from multiple sources, or prolonged ecological degradation. Individuals affected by this type of property damage frequently encounter difficulties in proving fault and causation under current civil liability statutes. Fisher et al. (2009) argue that scientific uncertainty is pervasive in environmental disputes. Current research highlights the increasing needs for courts to review sophisticated scientific models and technical evidence in environmental liability cases (Paloniitty & Kotamäki, 2021).

The main problem with tort law in Jordan is not the absence of a general liability scheme but rather the application of the conventional elements of fault and causation to diffuse, highly technical, and difficult-to-attribute environmental harm. Accordingly, while a fault-based liability scheme promotes fairness and legal security, it may be under-inclusive when applied to contemporary environmental damage, thereby reducing the compensatory and deterrent functions associated with civil liability (Alsharqawi et al., 2020).

5.2. Risk-Based Liability Theories

Risk liability theories have developed to address the limitations of traditional fault-based liability when an activity is known to cause harm or could reasonably be expected to produce harm, even in the absence of proven wrongdoing. Instead of focusing on concepts of blame and moral culpability, risk-based liability theories focus on determining who will bear the risk of loss or damage arising from the activity that created, controlled, or benefited from the hazardous condition. Risk is particularly relevant in environmental law because pollution can arise from lawful industrial, commercial, or technical activities that nonetheless pose a substantial risk to public health, natural resources, and ecosystems (Manasra et al., 2022). To help determine whether environmental harm should continue to be governed solely by ordinary civil liability rules or whether some activities that carry an above-average level of risk should be assigned a higher level of responsibility, the concept of risk-based liability may be a helpful analytical tool in Jordan.

5.2.1. Strict Liability Theory

Risk-based liability is exemplified by strict liability. Liability generally arises where there are damage and a causal relationship between that damage and hazardous activity, rather than proof to fault. The strict liability approach is especially applicable to environmental matters arising from industrial production methods, hazardous waste disposal, mining, energy generation, or other activities that pose risks to the environment, all of which can have potentially catastrophic consequences despite being conducted in compliance with appropriate regulatory approval (Younes & Alsharqawi, 2021). The value of strict liability in environmental disputes in Jordan is particularly significant because operator often contend that they have complied with the conditions of the applicable permits and the regulatory framework. However, the victim has also suffered injury or damage due to pollution caused by that operator. Therefore, the issue at hand is not only proving that harm or damage has occurred but also proving fault on the part of the operator, as would be required by traditional fault-based principles. From an economic perspective, Calabresi (1970) argued that liability rules can promote efficiency by placing accident costs on those best positioned to prevent harm or mitigate its consequences.

The ability to control the hazards generated by one's own activities should motivate operators to invest in safer technologies, monitoring equipment, and preventive measures (Younes & Alsharqawi, 2020). To this end, strict liability shifts the focus of responsibility from post-harm fault determination to the proactive management of environmental risks before harm occurs. The law's preventive function is particularly crucial when dealing with potential irreversible environmental harm, scientifically uncertain harm, and harm that is difficult to measure (Shi et al., 2023).

Recent empirical studies have shown that environmental liability mechanisms influence firm behavior, encouraging pollution control, risk management, and sustainability in operations (Ning et al., 2023; Madjid et al., 2026). Strict liability is one of the ways by which legal systems implement the polluter-pays principle.

The polluter-pays principle is a fundamental principle in environmental law. Deterrence and compensation costs are to be paid by the polluter. That is to say, the rule imposes on the party responsible for the pollution the obligation to bear both deterrence and compensation expenses, the latter of which shall go to the claimant or the state if the claimant does not wish to claim it (Faure & Peeters, 2019). However, strict liability must be subject to clearly defined legal prerequisites.

This would make the implementation effective, as the law comprehensively defines hazard legislatively to establish clear standards of causation, judicial capacity for adjudication, and protection against the imposition of unreasonable burdens on legitimate business operations (Gharibeh et al., 2023). Thus, strict liability should be seen not as replacing tort liability entirely, but as a focused instrument for particularly hazardous environmental activities (Siems, 2022).

5.2.2. Risk Theory and Enterprise Liability

Enterprise liability promotes risk-based thinking by tying liability to economic activity. Companies that profit from activities that could harm the environment should have to pay for prevention, monitoring, cleanup, and compensation as part of their normal business expenses. This is particularly relevant for Jordan, where pollution can come from legal industrial or commercial activities without any proven negligence. However, enterprise liability should not be applied universally. In the context of Jordan, a hybrid model would be more appropriate: fault-based liability for ordinary civil claims and more stringent risk-based liability for hazardous activities that present significant environmental risks (Ning et al., 2023; Shi et al., 2023).

5.3. Hybrid Approaches and Modern Trends

A hybrid environmental liability regime is preferable because neither fault-based nor strict liability alone ensure fairness and legal certainty for all types of environmental damage. The major areas where fault-based liability does not provide enough incentive for prevention are cumulative or collective pollution, scientific uncertainty, and multi-actor pollution. The author proposes a model that would most likely be suitable for general civil liability for conventional private damage, but

with stricter risk-based rules for hazardous activities and severe environmental harm (Cosnita-Langlais & Langlais, 2024). The proposed model preserves the structure of the Jordanian Civil Code while, at the same time, adjusting the rules of causation to accommodate the special nature of environmental damage, allowing proof of ecological injury, and creating other remedies besides money. This would enable the same law in Jordan to remain fair and certain, while also improving compensation, deterrence, prevention, and environmental restoration. This would perhaps be impossible with the other approaches, as they are largely incompatible with the existing civil law system of Jordan and would require substantive amendments to the Civil Code since they are all based on fault liability, which contradicts the general principles of the Jordanian Civil Code (Manasra et al., 2022; Al-Khalaileh et al., 2023).

6. Critical Analysis of Jordanian Law

The main legal frameworks for environmental pollution in Jordan are the general civil liability rules and Environmental Protection Law No. 6 of 2017. Pollution is defined under the Environmental Protection Law as any change in environmental elements that exceed legal standards or causes environmental damage. However, the law is primarily administrative and regulatory. It sets environmental standards, obligations, and enforcement procedures, but it does not establish a comprehensive, independent regime of civil liability for environmental damage. Thus, claims for compensation in relation to a pollution event continue to be mostly based on general civil liability rules, thereby creating a mismatch between the specialized nature of environmental damage and the general rules used for its remedy (Almanasra et al., 2022)

Article 256 of the Civil Code is a general provision serving as a basis for the award of damages for loss or injury caused by one person to another. There is no specific mention of applicability to claims on environmental pollution. In traditional civil liability, it is assumed that a plaintiff can identify the loss or damage suffered and attribute it to the actions of a defendant, thus proving a direct causal connection between the actions of the defendant and the loss or damage suffered as a result thereof (Xue, 2017). Generally, the rules of civil liability do not adequately address the special features of claims for environmental compensation, including standing, causation, and ecological damage, as recently emphasized by scholars in Jordan (Al-Khalaileh et al., 2023). The problem does not lie in the absence of a rule of general liability but in the inadequacy of that rule in dealing with the complex nature of environmental harm.

The doctrinal value of Decision No. 1989/2025 lies in its rejection of lawful use as an absolute defense. In other words, by stating that the exercise of a right may still be subject to liability when it causes abnormal or excessive harm, the Court of Cassation gives the much-needed reference for extending civil liability to harmful results licensed or formally lawful activities. This kind of reasoning applies to environmental pollution because most polluting activities come under administrative authorization, including but not limited to industrial production, waste disposal, and commercial operations, while such pollution has serious effects on the environment (Court of Cassation, 2025).

However, the court's argument will not stand up to modern liability challenges in the environment. It does not express an emerging common law principle on harm to the environment. The ruling does not lay down a particular test for environmental harm or deal with issues peculiar to cumulative pollution, scientific uncertainty, ecological damage, and multiple contributing polluters. Likewise, it does not clarify whether administrative compliance should simply be proof of reasonable conduct or whether it should be immaterial where the activity gives rise to abnormal environmental risk. Consequently, the judgment remains firmly rooted in the traditional civil liability framework on fault, damage, and causation rather than adopting a sensitive approach to risks of hazardous activities (El-Refaie et al., 2021).

The Jordanian environmental liability framework is relatively more relaxed than France and Europe. French law allows recovery for damage to the environment itself, a concept of environmental injury distinct from that known in ordinary tort cases between individuals or concerning private property (French Civil Code, 2016, arts. 1246–1247). The European environmental liability regime is based on the principle of the polluter pays and prevention, remediation, and accountability for environmental risks (European Parliament & Council, 2004). By contrast, Jordanian law has not yet adopted comparable mechanisms, such as specialized rules on ecological restoration, evidentiary presumptions, or strict liability for hazardous environmental activities.

Environmental tort claims face another substantial hurdle in establishing causation. In general, civil liability, the claimant must establish a causal relationship between the damage suffered and the conduct of the defendant (Al-Dlabeeh et al., 2022). Such a requirement is easy to satisfy in the average civil dispute since the injury, the tortfeasor, and the cause of the injury are usually identifiable. However, in cases of environmental pollution, proving causation is more difficult because the effects of pollution may manifest slowly over time, result from cumulative emissions by multiple actors, and occur through multiple pathways. Scientific evidence of this kind is generally very technical (Lees & Viñuales, 2019). For example, scientific modelling and studies on the assessment of water quality indicate that the identification of sources of pollution is technically demanding and usually requires monitoring data as well as expert interpretation, particularly in the case of pollution from multiple point and non-point sources (Mirnezhad & Zolfaghari, 2024; Shakarami et al., 2025). This situation is made worse in Jordan, where environmental claims are still subject to the ordinary rules of evidence. There are no specialized statutory presumptions of causation or rules that shift the evidentiary burden to polluter. Accordingly, evidentiary reforms are needed, including increased reliance

on expert testimony, presumptions of causation in cases involving hazardous activities, and a shift in the burden of proof when the alleged polluter has superior access to technical information. Liability becomes particularly difficult when the source of environmental damage is widespread, technical, or hard to identify, as recent Jordanian scholarship has confirmed (Al-Khawaldah et al., 2023).

Jordanian law does not create separate categories for personal injury, property damage, or pure ecological damage. Under traditional civil liability, therefore, claimants have been able to recover more easily for harm to health, land, property, or economic interests. Ecological damage refers to harm to ecosystems, biodiversity, water, soil, air quality, and natural habitats that do not cause immediate individual loss. Modern environmental law considers the environment to be an independent legal interest, not merely an extension of private property or a matter of personal injury (Al-Dlabeeh & Alsharqawi, 2023). Therefore, this inadequacy is interconnected with the inadequacy of available remedies. Under the general principles of tort law, the victim is mainly compensated after the occurrence of harm. However, it does not lay down restoration, rehabilitation, monitoring, or any aspect of the prevention of environmental damage, such as a specific regime of civil liability for certain types of environmental damage attached to specific remedial measures, as provided by the Environmental Protection Law through preventive and regulatory tools. Recent legal analysis demonstrates that the Jordanian environmental legislation does not contain explicit provisions related to compensation or reparation for the specific damages resulting from environmental degradation (Al-Hammouri et al., 2023c; El-Refaie & Alsharqawi, 2022).

In practical terms, this structural gap has significant implications for litigants, courts, and regulators: high evidential burdens on victims; fitting ecological damage into the usual tort classes for courts; and the lack of automatic translation of regulatory findings into civil compensation. It is true that the law applies the general principle of pollution through administrative standards, but compensation continues to govern by the general rules of civil liability for ordinary private harm. Fragmentation of a general system is inadequate to deal with complex causation, environmental harm, dangerous practices, and sustained degradation. Monetary compensation should be part of effective environmental liability, together with restoration, injunctive relief, and monitoring obligations, rehabilitation, and preventive measures. However, the existing general principles of environmental liability are limited because they depend on case-by-case judicial interpretation and do not generate a unified civil liability framework. Recent research has also shown general tort principles to be inadequate for environmental pollution, given the complexity and collective nature of the tort (Gharibeh et al., 2023).

7. Proposed Legal Reform: Towards a Hybrid Environmental Liability Model in Jordan

This study concludes that the Jordanian legal system establishes a foundational framework for environmental liability by integrating the general regime of civil liability under the Jordanian Civil Code with the provisions of the Environmental Protection Law No. 6 of 2017. More specifically, the recommended hybrid model combines fault-based liability for ordinary civil damages and strict or risk-based liability for hazardous yet lawful activities and severe environmental harm. The recommendation is not to replace the existing civil liability regime but to strengthen it through a targeted reform that is tailored to the capacity of the Jordanian judiciary, the structure of its legislation, its enforcement mechanisms, and its economic context. This is particularly relevant in cases of pollution resulting in cumulative harm, situations where there is scientific uncertainty, ecological damage, and hazardous yet lawful activities (Faure & Peeters, 2019; Zhai, 2022).

7.1. Strict Liability and the Polluter-Pays Principle

The suggested hybrid model should be based on strict liability for hazardous environmental activities. This is because, under Jordanian law, environmental compensation generally depends on proof fault, damage, and causation. This standard is well suited to ordinary civil disputes; however, it often falls short in cases of industrial pollution, hazardous waste, mining, energy production or long-term ecological degradation. In such cases, victims may be left without compensation even when serious environmental harm is evident because fault and direct causation are difficult to prove (Liu, 2021).

Therefore, Jordan should adopt strict liability for hazardous activities but only through a carefully defined statutory framework. Faure and Partain (2019) argue that operators should be liable for environmental damage resulting from hazardous activities without fault, where damage and a causal link are established. This approach would internalize the costs of prevention, reduction, and remediation while safer technology is encouraged as well as monitoring systems and practices that reduce risk (Faure & Peeters, 2019). However, this would be possible only with clear legislative definitions of hazardous sectors, judicial reliance on technical expertise, manageable evidentiary rules, and safeguards against excessive burdens on ordinary lawful economic activity. Therefore, the rule should apply mainly to chemical industries, hazardous waste disposal, mining, energy production, and other activities that pose a substantial environmental risk (Liu, 2021).

Polluter should be applied as a liability rule in civil matters, not merely a principle of regulation. It is the principle of the implicitly contained Jordanian environmental regulations. However, it has not yet become a clear rule that holds the polluter responsible for the financial consequences of the pollution they cause. Without such a rule, environmental costs

are likely to be shifted onto victims, public authorities, or even the public, especially when the damage is collective, diffuse, or ecological in nature. In comparative environmental law, particularly under the European environmental liability regime, liability is imposed on the operator whose activity has caused the environmental damage (European Parliament & Council, 2004). Statutory reform is required in Jordan to define recoverable environmental costs, clarify the relationship between administrative penalties and civil liability, and address liability in situations involving multiple polluters or scientific uncertainty (Zhai, 2022).

7.2. Evidentiary Reform and Ecological Damage

Causation remains one of the major impediments to the effective implementation of environmental liability in Jordan. Under ordinary civil liability, the claimant must prove that the conduct of the defendant caused the harm suffered. This promotes legal certainty, but difficult to establish in pollution cases, since environmental damage is usually accumulative, scientifically uncertain, and attributable to multiple actors. Therefore, a valid claim may fail where damage exists, but causation cannot be proved under normal evidentiary standards (McConville & Chui, 2017).

The Jordanian rules of evidence should allow the adoption of specific evidentiary rules for environmental cases, provided the requirement of causation is not removed. Expert evidence, scientific fundings, environmental monitoring reports, and regulatory inspections records should be admissible in a Jordanian court. Recent studies affirm that environmental litigation demands peculiar regulation regarding onus probandi, expert evidence, standards of proof, and methods for assessing environmental damage (De Gregorio, 2023).

A sound reform would create presumptions of causation in cases where pollution is scientifically linked to a hazardous activity or where the relevant technical information is under the operator's control. A fair reform would shift the burden of proof to defendants only after the plaintiff has established a prima facie case. The plaintiff will still have to show some reasonable connection between the activity and the harm; however, the operator will have to prove that it did not cause or contribute to the damage. This is more relevant in cases of industrial emissions, hazardous waste, water contamination or long-term ecological degradation, where generally the operator generally has better access to technical information (Al-Khawaldah et al., 2023).

Jordanian law should also recognize ecological damage as an independent legal interest distinct from personal injury, property damage, or economic loss. Environmental claims currently succeed more easily in Jordan if a claimant can prove direct harm to health, land, property, or financial interests. However, pollution can injure ecosystems, water, land, air quality, and natural habitats even when no single claimant can prove direct personal loss. Therefore, the proposed reform should define ecological damage within the proposed law of torts, to identify who has standing to sue, determine which forms of damage are recoverable, and established criteria for assessing restoration. Comparative developments include the recognition of ecological damage under the French Civil Code (French Civil Code, 2016, arts. 1246–1247). These elements should form the core of any legislative reform in Jordan.

7.3. Restorative Remedies and Environmental Compensation Fund

Monetary compensation remains appropriate in cases where the victims have suffered personal, property, or economic loss. It is, however, inadequate in cases of environmental damage, that is long-term, hard to quantify, and primarily affects ecosystems rather than individual interests. Environmental restoration should not be limited to the payment of damages especially in cases where the pollution concerns aquatic ecosystems, coastal environment, or natural resources where monitoring, rehabilitation, and preventive intervention are required (Asefi & Attaran-Fariman, 2022; Ahmed et al., 2025). Thus, environmental liability should include remediation, ecosystem rehabilitation, and monitoring obligations as well as injunctions against continuing pollution. This is in line with the comparative models of environmental liability whereby compensation goes hand in hand with prevention and restoration (European Parliament & Council, 2004).

The Jordanian law should empower the courts to order environmental restoration, site monitoring, rehabilitation measures, and preventive relief. Recent empirical research demonstrates that the effectiveness of environmental remedies depends on identifying the party responsible, scoping the damage, and having restoration procedures defined by law (Song et al., 2024). Such reforms would transform civil liability into a tool not only for compensating for damage after this but also for preventing, reducing, and repairing environmental harm.

Waste management and pollution reduction plans should be enforced as part of the national environmental regulations on sustainable livestock waste treatment and other high-risk pollution sources (Mousapour et al., 2025). In this regard, Jordan should consider establishing an environmental compensation fund for victims in cases where no identifiable or traceable polluter can be identified, the person at fault is incapable of paying, the damage was caused by multiple sources, or similar circumstances arise. The fund should be structured as a last-resort mechanism to ensure that, when normal civil liability cannot effectively identify or reach a responsible polluter, affected individuals and communities are not left without a remedy. This approach has been advocated by Cao (2022). The fund could be financed through contributions from high-risk sectors, environmental fines, regulatory fees, and compulsory financial guarantees from operators engaged in hazardous activities. Compensation funds provide more timely relief when traditional liability mechanisms are insufficient and help restore the environment (Xue, 2017). However, the fund should not shield polluters; it should instead operate as a mechanism of last resort, while

preserving a right of recourse against responsible parties once they have been identified.

8. Conclusion

This article examines the efficacy of fault-based civil liability in Jordan in addressing environmental pollution. It finds that the main problem is not the absence of environmental laws and regulations. Rather, the main problem tis the gap between public environmental regulation and private compensation. While the Environmental Protection Law No. 6 of 2017 sets out the regulatory framework for environmental protection in the country, most forms of compensation for pollution-related harm continue to be administered under the general civil liability provisions of the Jordanian Civil Code. These provisions are based on fault, damage, and causation and are appropriate for ordinary civil claims but not for cumulative, scientifically uncertain, ecological, or hazardous environmental harm.

8.1. Research Contributions

This article contributes to the literature by developing a Jordan-specific hybrid environmental liability model that links ordinary fault-based compensation with targeted risk-based liability, ecological damage, evidentiary reform, and restorative remedies. The model does not negate fault-based liability; rather, it retains fault-based liability for ordinary civil harm and, at the same time, imposes risk-based liability for dangerous enterprises and complex environmental harm. It also incorporates the polluter-pays principle, evidentiary rules, the concept of ecological damage, restorative relief, and an environmental restitution fund.

8.2. Practical Implications

Its application is of direct importance to legislators, courts, regulators, and victims of environmental damage. It provides the legislators with a reform path through targeted amendments rather than a comprehensive restructuring of Jordanian law. For the courts, it provides a clearer framework for addressing issues of causation, expert evidence, lawful yet harmful activities, and ecological damage. To regulators, it further clarifies the connection between environmental permits, monitoring obligations, and civil liability. Furthermore, it can help victims and affected communities gain access to compensation and restoration, especially in cases of cumulative pollution, technical complexity, or hazardous activities.

8.3. Limitations and Future Research

This study employs doctrinal and comparative legal methodology. It does not include empirical fieldwork, interviews with judges, regulators, or environmental experts, or quantitative analysis of environmental litigation in Jordan. Future research should explore how Jordanian courts assess causation in environmental tort claims, along with issues related to the admissibility of expert evidence in pollution cases and the feasibility of specialized procedural rules. Research should also examine the possibility of establishing an environmental compensation fund. Further studies are needed to examine the economic impact of strict liability on high-risk industries and the institutional capacity required to implement an effective hybrid environmental liability model.

Statements and Data Availability Statement

The data used in this research are provided in the text of the article.

Declaration on the Use of AI Tools

We used AI tools only to help with language editing and proofreading.

Conflict of Interest

The authors of this paper declared no conflict of interest regarding the authorship or publication of this paper.

Author contribution

Alsharqawi writing the original draft, and final review and editing.

Rshdan collected resources

Al-Seedi carried out comparative legal analysis.

Althabhawi developed the theoretical framework, validating legal arguments.

All authors read and approved the final version of the manuscript.

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