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LEGAL LIABILITIES OF CLIMATE CHANGE IMPACTS, A COMPARATIVE STUDY OF CIVIL AND CRIMINAL LIABILITY REGIMES IN UAE, UNITED STATES, AND EUROPE

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ABSTRACT

Climate change has become a major legal challenge, testing whether liability regimes can address cumulative, transboundary, and scientifically complex harm. This study assesses civil and criminal pathways for climate accountability through a comparative analysis of the United States, the United Arab Emirates, and selected European jurisdictions. It shows how civil claims (negligence, nuisance, and limited strict liability) depend on recalibrating duty of care, foreseeability, and contribution-based causation, supported by attribution science and emissions accounting, yet constrained by standing, justiciability, and displacement/pre-emption defences. It also evaluates criminal enforcement for high-culpability conduct (illegal releases, hazardous waste, monitoring tampering, and false reporting), while noting limits posed by proof beyond a reasonable doubt, mens rea, and enforcement capacity.

KEYWORDS: Climate Change Liability; Climate Litigation; Comparative Environmental Law; Civil Liability; Criminal Environmental Law; Attribution Science; UAE; United States; European Union.

1. INTRODUCTION

Climate change has become one of the most pressing challenges of our time, with far-reaching implications for the environment, society, and the global economy (USGCRP 2018, Burger, M., Wentz, J. and Horton, R. (2020)). As the scientific consensus on anthropogenic climate change has consolidated, attention has increasingly shifted toward the legal mechanisms capable of addressing its impacts and holding responsible actors accountable. In this sense, climate change harm has emerged as one of the most complex forms of harm in contemporary law: it is temporally extended and transboundary, intertwining scientific factors with economic considerations and public policy, while its causes are interconnected and its contributors are multiple States, corporations, and individuals. With the increasing frequency and intensity of climate-related disaster from severe heatwaves and flooding to sea-level rise legal demands have grown to transform “climate commitments” from political pledges into legally enforceable responsibility, so that climate harm does not remain without reparation and rights are not eroded by evidentiary obstacles, fragmented jurisdiction, or uncertainty surrounding causation. (IPCC (2023))

In this context, recent years have witnessed a marked expansion in climate litigation/disputes targeting States for shortcomings in adopting emissions-reduction policies or safeguarding fundamental rights and targeting major corporations either as significant contributors to emissions, for allegedly misleading the public about climate risks, or for failing to meet duties of care and environmental governance obligations. Recent reports confirm the global rise of this trajectory and the diversification of claimants, defendants, and claim types including State responsibility, corporate accountability, climate disclosure, and “greenwashing” claims. (Setzer, J. and Higham, C. (2025)).

A deeper challenge, however, is that traditional liability frameworks, whether civil tort liability or criminal liability were not historically designed to accommodate the nature of climate harm, which is cumulative, indirect in its effects, involves multiple contributors, and entails complex causal chains. Consequently, “attribution science” has emerged as an important tool for linking climate change to the probability and/or severity of certain extreme events, thereby influencing how causation and proof are constructed in litigation, while legal questions remain regarding doctrinal fit and standards for the admissibility of scientific evidence. (Burger, M.,

Wentz, J. and Horton, R. (2020), Pfrommer, T., Goeschl, T., Proelss, A. et al. (2019).

Accordingly, the research problem crystallizes in the following central question: To what extent can legal systems through civil and criminal pathways deliver effective accountability for climate-change-related harm? This gives rise to subsidiary questions concerning how the elements of civil liability (duty of care/fault, harm, and causation) can be adapted to climate realities; the limits of compensability and environmental reparation; and the challenges of jurisdiction and applicable law in cross-border disputes. Parallel questions arise for criminal policy: the prospects of criminalization, standards for attributing liability to legal persons, and the extent to which deterrence and prevention can be achieved. Against this backdrop, the “Paris Agreement goal” remains a central reference point, increasingly invoked to shape standards of care and obligation especially the objective of keeping warming “well below 2°C” and pursuing efforts toward “1.5°C”. (UNFCCC (2015)).

The criminal liability track has acquired renewed importance; considering comparative legislative trends aimed at strengthening environmental protection through criminalization and sanctions. A prominent example is the European update to the Environmental Crime Directive, reflecting a move toward tougher enforcement of environmental criminal law and the development of sanctions and cross-border cooperation mechanisms. (Directive (EU) 2024/1203)

The research adopts a comparative analytical approach that balances key trends across influential legal settings, while drawing on recent international developments that further “juridify” climate obligations. Notably, the International Court of Justice advisory opinion issued on 23 July 2025 on States’ obligations in respect of climate change represents an interpretive development with potential to shape discourses of responsibility and climate litigation domestically and transnationally. (ICJ (2025)).

Thus, this study demonstrates that accountability for climate-change harm is no longer merely a moral or political question; it has become a test of law’s capacity to respond to a complex harm that exceeds traditional liability boundaries. The core wager is a shift from a general sustainability discourse to a legal framework capable of identifying responsible actors, proving contributions, providing reparation, and deterring harmful conduct within fair, balanced, and practically enforceable standards. (UNEP (2024)), IPCC (2023)).

Within this comparative framework, the study examines climate-change-related civil and criminal liability across multiple legal systems. It discusses selected Arab legal frameworks, with particular emphasis on the United Arab Emirates as a representative model of emerging climate and environmental regulation in the Arab region, while referring, where relevant, to broader Arab legislative approaches. The analysis also engages with the legal system of the United States, given its extensive body of climate litigation, influential federal environmental statutes, and judicial doctrines shaping standing, causation, and regulatory displacement.

In this context, references in this study to “European jurisdictions” are not intended to encompass Europe as a homogeneous legal space. Rather, the European analysis focuses on a dual level: (i) European Union law and institutions, particularly where EU directives, regulations, and emissions-trading mechanisms establish harmonized standards or minimum obligations; and (ii) selected national jurisdictions that have played a leading role in climate litigation and environmental enforcement, notably Germany, France, and the Netherlands. These jurisdictions are examined due to their advanced judicial practice, legislative developments, and influence on the evolution of climate liability doctrines within and beyond the European legal sphere.

1.1. Background And Significance of the Issue

The accelerating pace of climate change poses significant risks to ecosystems, communities, and economies worldwide. Rising global temperatures, melting ice caps more frequent extreme weather events, and shifting precipitation patterns are just a few of the observable consequences of anthropogenic greenhouse gas emissions. These impacts manifest in various ways, including increased frequency and severity of natural disasters, loss of biodiversity, disruptions to agricultural systems, and threats to human health and livelihoods. (IPCC (2022)).

In response to these challenges, there has been a growing recognition of the need for robust legal mechanisms to address climate change impacts and hold accountable those responsible for contributing to them. Civil society organizations (Farr, Douglas. (2018)), affected communities, and governments are increasingly turning to legal avenues to seek redress for climate-related damage, demand accountability from major polluters, and compel action to mitigate future harm. This burgeoning field of climate change litigation reflects both the urgency of the climate

crisis and the inadequacy of existing regulatory frameworks to effectively curb emissions and protect vulnerable populations. (Setzer, J. and Higham, C. (2025))

1.2. Overview Of Legal Framework Regarding Climate Change Liabilities

The legal framework governing civil and criminal liabilities for climate change impacts is complex and multifaceted, encompassing a diverse array of national, international, and transnational laws, treaties, regulations, and judicial decisions. At the national level, legal liability for climate change is typically grounded in principles of tort law, environmental law, and, increasingly, human rights law. Civil litigation against corporations, governments, and other entities alleged to have contributed to climate change through greenhouse gas emissions, deforestation, or other activities is on the rise in jurisdictions around the world. (Setzer, J. and Higham, C. (2025))

In addition to civil liability, there is a growing recognition of the potential for criminal sanctions to deter egregious environmental misconduct and hold individuals and corporations accountable for climate-related offenses. Endangerment Statutes addressing environmental harm, pollution, and endangerment are being invoked with increasing frequency to prosecute violations that contribute to climate change, such as illegal logging, toxic waste dumping, and fraudulent emissions reporting. (ENRD (2024)).

Internationally, efforts to address climate change through legal means are predominantly governed by the United Nations Framework Convention on Climate Change (UNFCCC) and its various protocols, including the Paris Agreement. While these instruments primarily focus on mitigation and adaptation measures rather than liability and compensation (FCCC/CP/2015), they provide a framework for international cooperation and collective action to combat climate change. (UNFCCC (1992)).

Despite these legal developments, significant challenges remain in effectively addressing climate change liabilities through the legal system. These challenges include issues of jurisdictional competence, evidentiary burdens, causation complexities, and the reluctance of courts to wade into politically charged disputes involving complex scientific and policy considerations. (Setzer, J. and Higham, C. (2025)).

Considering these challenges, there is a need for further research, analysis, and advocacy to

strengthen legal frameworks for addressing climate change liabilities, promote accountability for environmental harm, and advance climate justice for affected communities. This paper seeks to contribute to this ongoing dialogue by examining the evolving legal landscape surrounding civil and criminal

liabilities for climate change impacts and exploring potential avenues for enhancing legal accountability in the face of the climate crisis. (Setzer, J. and Higham, C. (2025)).

2. FIGURES AND TABLES

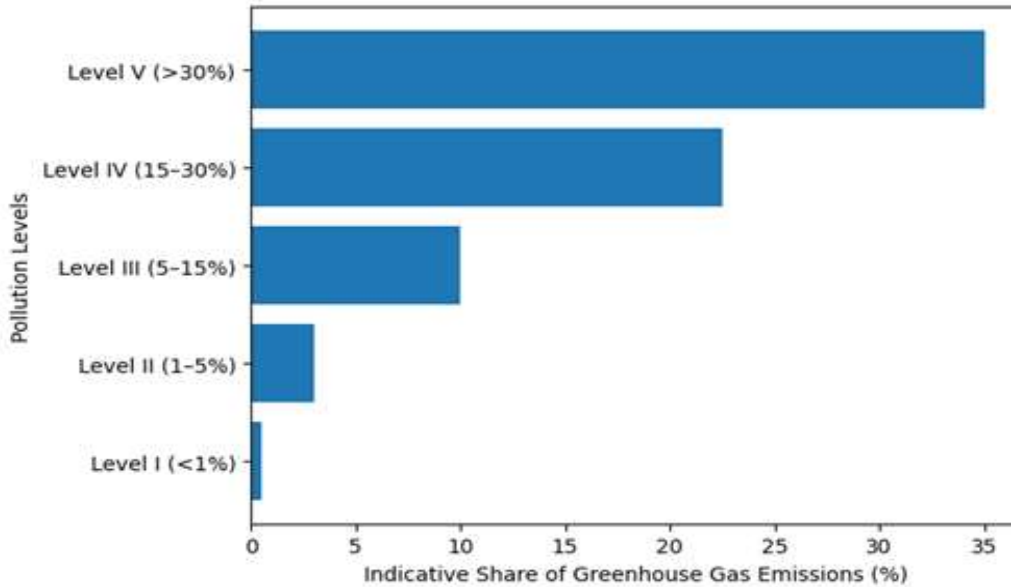


Figure 1: Proposed Legislative Thresholds for Pollution Contribution and Liability.

Figure 1 illustrates a graduated legislative model for calibrating climate-related liability based on proportional contribution to greenhouse gas emissions. The horizontal axis represents indicative contribution ranges rather than fixed numerical thresholds, while the vertical axis reflects corresponding legal responses, ranging from regulatory monitoring to civil and criminal liability.

The contribution ranges are intentionally expressed as bands rather than precise percentages, emphasizing flexibility and proportionality. At lower contribution levels (approximately below 1%), the model prioritizes monitoring, reporting, and preventive compliance obligations, consistent with the de minimis principle and fairness in attribution. As contributions increase into measurable and

significant ranges, the framework supports a transition toward fault-based civil liability, including compensation and injunctive relief, accompanied by evidentiary recalibration in favor of affected parties.

At the highest contribution levels, where emissions become systemic or dominant, the model justifies the activation of presumptive or strict civil liability and, where accompanied by culpable conduct such as knowledge, recklessness, or deception, the potential engagement of criminal liability. Accordingly, Figure 1 should be understood as a conceptual and normative tool to assist legislators and courts in aligning legal responses with the scale and seriousness of pollution contributions, rather than as a rigid quantitative liability formula.

Table 1: Proposed Legislative Framework for Pollution Levels and Climate Liability.

Regulatory Objective	Type of Liability	Applicable Legal Framework	Indicative contribution Range	Level of pollution contribution
Monitoring, reporting, and compliance	No compensatory liability	Preventive regulatory framework	Below 1%	Very Low
Risk prevention and mitigation	Limited compensation	Fault-based civil liability	1% - 5%	low
Environmental rebalancing	Compensation and restorative remedies	Presumptive civil liability	5% - 15%	Medium
Deterrence and structural compliance	Full compensation and injunctive relief	Enhanced civil liability	15% - 30%	High

General deterrence and environmental protection	Sanctions and full compensation	Strict civil liability and potential criminal liability	Above 30%	Severe / Systemic
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Table I translates proportional contribution to greenhouse gas emissions into a graduated liability framework, illustrating how regulatory, civil, and criminal responses may be progressively engaged in accordance with the scale and seriousness of pollution contributions, while preserving proportionality and legal certainty.

3. CLIMATE CHANGE IMPACTS OVERVIEW:

Climate change is a multifaceted phenomenon characterized by shifts in global temperature patterns, weather events, and environmental conditions, primarily driven by human activities, notably the emission of greenhouse gases (GHGs) such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) (Wallace-Wells, David. (2019)). This section provides an overview of climate change and its wide-ranging impacts on the environment, society, and the global economy, drawing upon key scientific findings and projections.

3.1. Explanation of Climate Change and Its Environmental, Social, And Economic Impacts

Climate change is fundamentally altering ecosystems, weather patterns, and natural processes on a global scale, resulting in a multitude of environmental, social, and economic impacts. The increased concentration of greenhouse gases in the atmosphere, primarily due to the burning of fossil fuels, deforestation, and industrial activities, is leading to a rise in global temperatures, changes in precipitation patterns, and the acidification of oceans. (IPCC (2022))

These environmental changes have far-reaching consequences. They contribute to the loss of biodiversity, habitat degradation, and the disruption of ecosystems, endangering countless species and undermining the services they provide, such as pollination, carbon sequestration, and water purification. Rising temperatures also exacerbate extreme weather events, including heatwaves, droughts, floods, hurricanes, and wildfires, which pose significant risks to human health, infrastructure, agriculture, and food security. (WHO (2023), Hallegatte, S., Bangalore, M., Bonzanigo, L., et al. (2016)).

Moreover, climate change has profound social and economic implications, disproportionately impacting vulnerable communities, particularly in developing countries and low-lying coastal regions.

It exacerbates poverty, inequality, and social unrest, displaces populations, and exacerbates existing environmental injustices. The economic costs of climate change are staggering, encompassing damage to infrastructure, property, and natural resources, as well as increased healthcare expenses, lost productivity, and disruptions to supply chains and markets. (Hallegatte, S., Bangalore, M., Bonzanigo, L., et al. (2016)).

According to the Intergovernmental Panel on Climate Change (IPCC), if left unchecked, climate change could lead to irreversible and catastrophic consequences, including the loss of entire ecosystems, widespread food and water shortages, mass migration, and geopolitical instability. Addressing climate change requires urgent and concerted action at all levels of society to mitigate emissions, adapt to changing conditions, and build resilience to future impacts. (IPCC (2022)).

3.2. Overview of Key Scientific Findings and Projections

Scientific research provides compelling evidence that climate change is occurring at an unprecedented rate and is primarily driven by human activities. According to the IPCC's Fifth Assessment Report, released in 2014, global temperatures have risen by approximately 0.85°C (1.5°F) since the late 19th century, with the past decade being the warmest on record (IPCC (2014), (IPCC (2013))). Atmospheric concentrations of CO₂, CH₄, and N₂O have reached levels unprecedented in at least the last 800,000 years, primarily due to the combustion of fossil fuels and deforestation. (IPCC (2013)).

Projections indicate that without significant reductions in GHG emissions, global temperatures could increase by 1.5°C to 4.5°C (2.7°F to 8.1°F) by the end of the 21st century, leading to increasingly severe and widespread impacts. These include more frequent and intense heatwaves, storms, and precipitation events; melting ice caps and rising sea levels; shifts in agricultural productivity and food availability; and the loss of critical ecosystems such as coral reefs and polar regions. (IPCC (2013)).

The impacts of climate change are not uniform, with certain regions and communities facing disproportionate risks and vulnerability. Vulnerable populations, including indigenous peoples, low-income communities, women, children, and the elderly, are particularly susceptible to the adverse effects of climate change due to factors such as

limited access to resources, inadequate infrastructure, and social marginalization. (Article 6.8 (UNFCCC) (2015).

Considering these scientific findings and projections, there is an urgent need for decisive action to mitigate greenhouse gas emissions, enhance resilience to climate change impacts, and transition to a sustainable, low-carbon future. Failure to address climate change effectively risks irreversible damage to ecosystems, human societies, and the global economy, underscoring the importance of understanding and addressing the complex challenges posed by this existential threat.

4. CIVIL LIABILITY OF CLIMATE CHANGE

Civil liabilities pertaining to climate change impacts are integral to ensuring accountability and addressing environmental harm. This section delves into the overview of civil liability principles within environmental law, examining legal theories, precedents, and real-world case studies from diverse legal systems such as the USA (The Clean Air Act) the UAE (Report of the Arab Forum for Environment and Development (AFED) 2009) and various European jurisdictions.

4.1. Overview of Civil Liability Principles in Environmental Law

Civil liability principles in environmental law are foundational to holding individuals, corporations, and governments accountable for their actions that contribute to climate change. These principles are embedded in legal systems worldwide and are typically based on established tort law doctrines. Key legal theories underpinning civil liability in the context of climate change include negligence, strict liability, nuisance, and trespass. (Directive 2004/35/EC)

Negligence: Negligence claims require a plaintiff to establish a duty of care, breach, damage, and a legally sufficient causal connection; in climate cases, controversy often concentrates on the content and scope of the duty (including whether large emitters or public authorities owed reasonable care to limit foreseeable climate risks) and on causation, where courts may be asked to accommodate probabilistic and contribution-based reasoning rather than a simple “but-for” model. This theory requires parties to exercise reasonable care to prevent foreseeable harm to others. In the context of climate change, negligence may apply to entities failing to take reasonable measures to reduce emissions or mitigate environmental impacts. (Netherlands v. Urgenda Foundation (ECLI:NL:HR: 2019:2007)).

Strict Liability: Strict liability, by contrast, dispenses with proof of fault where harm arises from abnormally dangerous activities, but its applicability to greenhouse-gas emissions is frequently contested given the diffuse nature of emissions and their integration into ordinary economic activity, notwithstanding stronger arguments in circumstances involving highly hazardous or tightly localized industrial conduct. This principle may be invoked in cases involving activities such as fossil fuel extraction or industrial pollution. (Milieudefensie et al. v. Royal Dutch Shell plc (C/09/571932 / HA ZA 19-379).

Nuisance: Nuisance claims arise from activities that unreasonably interfere with others' use or enjoyment of their property. Climate change-related nuisances can include air pollution, water contamination, or other environmental disruptions.

Trespass: Trespass, traditionally premised on a direct physical invasion of property, may be conceptually and evidentially harder to sustain for global climate impacts, but it remains relevant in cases of measurable particulate or contaminant intrusion onto neighboring land. Collectively, these civil theories illustrate both the availability of doctrinal pathways for climate accountability and the need for careful calibration of duty, causation, and remedial design to avoid either under-enforcement or unbounded liability. (UNEP. (2025)).

4.2. Analysis of Legal Theories and Precedents for Civil Liability Related to Climate Change Impacts

Legal theories and precedents for civil liability related to climate change vary across jurisdictions and legal systems. In the USA, landmark cases such as *Massachusetts v. EPA* and *Connecticut v. American Electric Power Co.* (*American Electric Power v. Connecticut*, 564 U.S. 410 (2011)) have established precedent for governmental and corporate accountability for greenhouse gas emissions. These cases have shaped the legal landscape surrounding climate change litigation and set important precedents for future lawsuits.

Similarly, European legal systems have seen significant litigation related to climate change impacts. Notable cases include *Uganda Foundation v. The State of the Netherlands*, where a Dutch court ruled that the government had a legal obligation to take more ambitious action to mitigate climate change, and cases brought against corporations for their contributions to climate change through emissions and environmental degradation.

In the UAE, civil liability principles related to

climate change may be informed by Islamic law (Sharia) and specific environmental regulations. While there may be fewer precedents specifically addressing climate change impacts in the UAE legal system, civil lawsuits related to environmental harm, such as air pollution or habitat destruction, could potentially be brought under existing tort and environmental laws. (Bruckner, B., Edenhofer, O., Koch, N., Steckel, J., 2023)

4.3. Case Studies and Examples of Civil Lawsuits Against Corporations, Governments, And Other Entities:

Real-world case studies provide valuable insights into the application of civil liability principles in climate change litigation. Examples of civil lawsuits against corporations, governments, and other entities highlight the diverse strategies and legal remedies available to address climate-related harms. These case studies underscore the importance of civil litigation in promoting corporate accountability, advancing environmental justice, and catalyzing policy change. (*American Electric Power Co. v. Connecticut*, 564 U.S. 410 (2011))

By examining legal theories, precedents, and case studies from different legal systems, policymakers, legal practitioners, and advocates can gain a deeper understanding of effective strategies for holding entities accountable for their contributions to climate change impacts. These insights can inform future litigation efforts, shape environmental policy, and drive progress towards a more sustainable and equitable future.

5. CHALLENGES AND LIMITATIONS IN CIVIL LITIGATION

Civil litigation serves as a vital avenue for seeking accountability and redress for climate change damages. However, this section highlights the complexities and hurdles that litigants often face when pursuing civil claims related to climate change impact (Michael B. Gerrard and John C. Dernbach, *Environmental Law Reporter* (2019)). Drawing upon real-life cases and expert analyses, it examines evidentiary challenges, causation issues, jurisdictional obstacles, and common legal defenses employed by defendants.

5.1. Discussion Of Evidentiary Challenges, Causation Issues, And Jurisdictional Obstacles

One of the primary challenges in civil litigation for climate change damage lies in establishing causation (*Joshua T. Galperin, Georgetown Environmental Law Review* (2019)) the link between the defendant's

actions and the alleged harm. Proving that specific emissions or activities directly caused climate-related damages often requires complex scientific evidence and modelling, which can be subject to scrutiny and debate. Furthermore, attributing responsibility for climate change impacts to individual defendants among a web of global contributors presents significant challenges.

Evidentiary challenges also arise due to the long timeframes and broad geographic scales over which climate change operates. Unlike traditional environmental harms with localized impacts, climate change affects global systems and unfolds over decades or centuries. This temporal and spatial disconnect complicates efforts to trace specific instances of harm back to individual defendants and quantify damage accurately. (Pfrommer et al., 2019), Burger, M., Wentz, J.A. and Horton, R.M. (2020)).

Jurisdictional obstacles further complicate civil litigation for climate change damage, particularly in cases with multinational defendants or cross-border impacts (*Handelskwekerij G. J. Bier BV v Mines de potasse d'Alsace SA* (Case 21/76)). Determining the appropriate forum for legal action, navigating conflicts of law, and overcoming procedural hurdles can impede access to justice and delay resolution. Moreover, some jurisdictions may lack the legal frameworks or precedents necessary to address novel issues (*Hari M. Osofsky and Jacqueline Peel, University of Illinois Law Review* (2010)) raised by climate change litigation effectively. (Setzer & Higham, *ibid*).

5.2. Analysis of Legal Defenses Commonly Used by Defendants

In climate change litigation, defendants often employ a range of legal defenses to challenge liability and evade accountability. These defenses exploit uncertainties in climate science, procedural obstacles, and traditional legal doctrines to deflect responsibility for climate-related harms. U.S. courts, for example, have treated redressability as a key constraint in climate-constitutional claims, while recognizing standing for sovereign plaintiffs in regulatory settings. (*American Electric Power Co. v. Connecticut*, 564 U.S. 410 (2011), *Lujan v. Defenders of Wildlife*, 504 U.S. 555 (1992)).

One common defense is the argument of lack of standing or ripeness, asserting that plaintiffs lack the legal right to bring the lawsuit or that the case is not yet ready for adjudication. Defendants may also challenge the causal link between their actions and the alleged damages, questioning the extent to which their emissions or activities contributed to climate

change impacts compared to other factors. (Pfrommer, T., Goeschl, T. and Proelss, A. (2019))

Pre-emption arguments, based on the idea that federal regulations or international agreements pre-empt state or local climate change litigation, are frequently raised by defendants, particularly in cases involving multinational corporations. Moreover, defendants may assert political questions or separation of powers defenses, arguing that climate change is a matter best addressed by the legislative or executive branches rather than the judiciary.

6. CRIMINAL LEGAL LIABILITIES

In the United Arab Emirates (UAE), criminal liability pertaining to climate change and environmental offenses is addressed through a combination of federal laws, regulations, and enforcement mechanisms. While the UAE's legal framework primarily focuses on preventive measures and regulatory compliance, it also includes provisions for imposing criminal penalties on individuals or entities found guilty of significant environmental violations contributing to climate change.

Federal Law No. 24 of 1999 Concerning the Protection and Development of the Environment serves as the cornerstone of environmental legislation in the UAE. This law outlines various environmental principles, responsibilities, and enforcement mechanisms aimed at safeguarding the country's natural resources and promoting sustainable development. While the law primarily emphasizes regulatory compliance and administrative penalties for environmental offenses, it also includes provisions for criminal liability in cases of egregious violations.

Under the UAE's legal system, criminal liability for environmental offenses, including those related to climate change, may arise when individuals or entities engage in intentional or negligent conduct that causes significant harm to the environment. Such offenses may include unlawful pollution, illegal waste disposal, habitat destruction, and other activities that contribute to environmental degradation and climate change impacts. (Rop White 2012)

The UAE Penal Code (Federal Law No. 31 of 2021) contains provisions for prosecuting individuals or entities responsible for environmental crimes. Article 28 of the Penal Code specifies penalties for offenses against the environment, which may include imprisonment, fines, or both, depending on the severity of the offense and its consequences. Additionally, Article 29 of the Penal Code stipulates

enhanced penalties for repeat offenders or those who commit environmental offenses with malicious intent (UAE legislation).

In cases where environmental offenses result in significant environmental harm or pose a threat to public health and safety, law enforcement authorities in the UAE may pursue criminal investigations and prosecutions. The Ministry of Climate Change and Environment (MOCCA) (Statement of Dr Thani bin Ahmed Al Zeyoudi 2020) and other relevant regulatory agencies collaborate with law enforcement agencies to investigate suspected environmental crimes, gather evidence, and prosecute offenders in accordance with applicable laws and regulations.

While criminal prosecutions for environmental offenses in the UAE may be less common than administrative or civil enforcement actions, the threat of criminal liability serves as a deterrent against egregious violations and reinforces the importance of environmental stewardship and compliance with regulatory requirements. By incorporating criminal sanctions into its legal framework, the UAE aims to deter individuals and entities from engaging in activities that harm the environment and contribute to climate change, thereby promoting sustainability and responsible environmental management.

6.1. Overview of Criminal Liability Principles in Different Environmental Laws

The legal systems of both the United Arab Emirates (UAE) and the United States (USA) have robust frameworks for addressing environmental crimes and holding perpetrators accountable for actions contributing to climate change. In the UAE, environmental laws such as Federal Law No. 24 of 1999 Concerning the Protection and Development of the Environment establish criminal liability for activities that harm the environment, including those that exacerbate climate change. Similarly, in the USA, statutes such as the Clean Air Act and the Clean Water Act provide avenues for prosecuting individuals and entities responsible for environmental violations, including those related to greenhouse gas emissions and pollution. Criminal liability in environmental law is typically grounded in principles of intent, negligence, or recklessness. In the UAE, individuals or entities found guilty of knowingly or negligently causing environmental harm can face imprisonment, fines, or both, as outlined in relevant provisions of Federal Law No. 24 of 1999. Similarly, in the USA, criminal liability for environmental offenses can result in significant

penalties, including substantial fines and incarceration, under federal laws such as the Resource Conservation and Recovery Act. (42 U.S.C. § 6928).

6.2. Examination of Criminal Statutes and Enforcement Actions Related to Climate Change Offenses

Both the UAE and the USA have enacted specific legislation and regulatory frameworks to address climate change offenses through criminal statutes and enforcement actions. In the UAE, the Ministry of Climate Change and Environment oversees environmental regulation and enforcement, working in conjunction with law enforcement agencies to investigate and prosecute violations. Notably, the UAE's Penal Code includes provisions for punishing individuals or entities responsible for environmental crimes, including those related to climate change, with penalties varying based on the severity of the offense. (Federal Law No. (24) of 1999)

In the USA, federal agencies such as the Environmental Protection Agency (EPA) play a central role in enforcing environmental laws and regulations aimed at mitigating climate change impacts. The EPA has the authority to investigate suspected violations, pursue enforcement actions, and collaborate with federal and state prosecutors to bring criminal charges against offenders (EPA (2025)). Legal instruments such as the Clean Air Act and the Clean Water Act empower enforcement agencies to address activities contributing to climate change, such as unlawful emissions and pollution. (42 U.S.C. § 7413(c))

6.3. Case Studies Illustrating Criminal Prosecutions for Environmental Violations Contributing To Climate Change.

Several case studies from both the UAE and the USA exemplify the prosecution of individuals and corporations for environmental violations exacerbating climate change. In the UAE, the prosecution of a construction company for illegally dumping hazardous waste into water bodies resulted in significant fines and imprisonment for company executives, highlighting the seriousness of environmental offenses. (Khaleej Times (2016).) Similarly, in the USA, the criminal prosecution of a coal-fired power plant for violating emissions standards underscored the government's commitment to holding polluters accountable for their contributions to climate change.

These case studies demonstrate the effectiveness of criminal prosecutions in deterring environmental

violations and promoting environmental stewardship. By enforcing existing laws and regulations, authorities in both the UAE and the USA send a clear message that actions detrimental to the environment, including those exacerbating climate change, will not be tolerated and will be met with severe consequences. Through continued enforcement efforts and public awareness campaigns, stakeholders aim to foster a culture of environmental responsibility and sustainability in combating climate change.

In the United States, criminal enforcement has been used against utilities and industrial actors for major pollution events linked to fossil-fuel infrastructure. A prominent example is the Duke Energy coal-ash incident, where subsidiaries pleaded guilty to criminal violations of the Clean Water Act and were sentenced to pay \$102 million (criminal fines and mitigation measures) following unlawful discharges associated with coal-ash management demonstrating the capacity of criminal law to impose significant penalties on corporate actors for serious environmental harm. (U.S. Attorney's Office, Eastern District of North Carolina (2015)). In addition, U.S. authorities have pursued felony outcomes for air-pollution monitoring tampering and false reporting at a power plant under the Clean Air Act, underscoring that criminal enforcement can also target conduct that undermines emissions oversight and compliance systems. (U.S. Attorney's Office, District of Massachusetts (2017)).

7. CHALLENGES AND LIMITATIONS IN CRIMINAL PROSECUTIONS

7.1. Discussion of Legal and Practical Challenges in Prosecuting Climate Change-Related Offenses Criminally

Prosecuting climate change-related offenses criminally poses a myriad of legal and practical challenges in both the United Arab Emirates (UAE) and the United States (USA). One significant challenge stems from the complex nature of climate change itself, which often involves diffuse sources of greenhouse gas emissions and long-term environmental impacts. As a result, establishing a direct causal link between specific actions and their contribution to climate change can be challenging, particularly in cases where multiple actors and factors are involved. (Burger, M., Wentz, J. A., & Horton, R. M, *ibid.*)

Moreover, prosecuting climate change-related offenses may require specialized expertise in environmental science, climatology, and other

technical fields to analyze the evidence and assess the extent of environmental harm. This necessitates collaboration between law enforcement agencies, regulatory bodies, and scientific experts, which can pose logistical and resource constraints.

In addition to legal and evidentiary challenges, practical considerations such as jurisdictional issues, cross-border implications, and the involvement of multinational corporations (Mann, Michael E. (2021)) further complicate the prosecution of climate change-related offenses. The transboundary nature of climate change requires international cooperation and coordination, which may be hindered by differences in legal systems, enforcement capacities, and diplomatic considerations.

Furthermore, the enforcement of criminal laws and regulations related to climate change may face resistance or pushbacks from vested interests, including industry stakeholders and political entities. Economic considerations, job security concerns, and the perceived trade-offs between environmental protection and economic growth can influence public perception and political will, impacting the prioritization and allocation of resources for prosecuting environmental crimes (Pfrommer, T., Goeschl, T., Proelss, A., Carrière, M., Lenhard, J., et al, *ibid*, (UNEP) & INTERPOL. (2016), UNEP (2024)).

7.2. Analysis Of Burden of Proof, Mens Rea Requirements, And Sentencing Considerations

In prosecuting climate change-related offenses criminally, legal principles such as the burden of proof, mens rea (guilty mind) requirements, and sentencing considerations play crucial roles in determining the outcome of criminal prosecutions.

The burden of proof in criminal cases requires prosecutors to establish guilt beyond a reasonable doubt, which can be particularly challenging in cases involving complex environmental issues such as climate change. Proving causation and demonstrating the direct link between specific actions and their contribution to climate change impacts may require extensive scientific evidence and expert testimony, adding complexity to the prosecution process. (EPA 2025)

Mens rea (a Latin term that translates to "guilty mind" in English) requirements, which pertain to the mental state or intent of the defendant, also present challenges in prosecuting climate change-related offenses. While some environmental laws may impose strict liability for certain offenses, proving the requisite level of intent or recklessness necessary for criminal liability can be difficult, especially in cases

involving corporate actors or systemic failures.

Sentencing considerations in climate change-related prosecutions may vary depending on the severity of the offense, the extent of environmental harm, and the culpability of the defendant. In both the UAE and the USA, criminal penalties for environmental offenses may include fines, imprisonment, probation, restitution, and remediation measures (Mann, Michael E. (2021)). However, determining appropriate sentencing outcomes that effectively deter future offenses while promoting environmental justice and rehabilitation remains a complex and often contentious issue.

Overall, addressing the challenges and limitations in prosecuting climate change-related offenses criminally requires a multidisciplinary approach, involving collaboration between legal experts, scientists, policymakers, and civil society stakeholders. By addressing evidentiary gaps, strengthening legal frameworks, and promoting international cooperation, efforts to hold perpetrators accountable for environmental crimes can contribute to advancing climate justice and sustainability goals globally.

8. COMPARATIVE ANALYSIS OF CIVIL AND CRIMINAL APPROACHES

8.1. Comparative Assessment of Civil and Criminal Legal Mechanisms for Addressing Climate Change Impacts.

In the legal frameworks of the United Arab Emirates (UAE), the United States (USA), Germany, France, and other European countries, both civil and criminal legal mechanisms play crucial roles in addressing climate change impacts. While civil liability focuses on compensating victims and remedying environmental harm through monetary damages or injunctive relief, criminal liability aims to deter wrongful conduct, punish offenders, and promote public accountability for egregious environmental offenses.

Civil liability laws in these jurisdictions typically allow individuals, communities, or government agencies affected by climate change impacts to seek legal redress through civil lawsuits. These lawsuits may target individuals, corporations, or government entities responsible for greenhouse gas emissions, pollution, deforestation, or other activities contributing to climate change. Civil remedies may include monetary compensation for property damage, loss of livelihood, or health-related costs, as well as court-ordered injunctions to stop harmful activities or require mitigation measures.

In contrast, criminal liability laws impose penalties, such as fines, imprisonment, or probation, on individuals or entities found guilty of intentional or reckless conduct that violates environmental laws and contributes to climate change. Criminal prosecutions for environmental offenses may target corporate executives, government officials, or other responsible parties, holding them criminally accountable for their actions. Criminal penalties serve as deterrents against future offenses and signal society's condemnation of egregious environmental misconduct.

8.2. Evaluation Of the Strengths, Weaknesses, And Complementarity of Civil and Criminal Liability Regimes

Both civil and criminal liability regimes have strengths and weaknesses in addressing climate change impacts, and they often complement each other in achieving environmental justice and accountability.

Strengths of civil liability regimes include their ability to provide swift and flexible remedies for environmental harm, empower affected communities to seek justice, and allocate financial responsibility for damages. Civil lawsuits can also incentivize compliance with environmental laws and encourage responsible corporate behavior by imposing financial liabilities on polluters.

However, civil liability regimes may face challenges in proving causation, assessing damages, and enforcing judgments, particularly in cases involving complex environmental issues like climate change. Additionally, civil remedies may be inadequate to address the systemic and widespread nature of climate change impacts, requiring complementary regulatory and criminal enforcement measures.

Criminal liability regimes, on the other hand, offer distinct advantages in deterring intentional or reckless misconduct, punishing egregious offenders, and promoting public accountability for environmental crimes. Criminal prosecutions can send a strong deterrent message to potential offenders, particularly high-level decision-makers or repeat offenders, and help uphold the rule of law and environmental justice principles.

Nevertheless, criminal liability regimes may face limitations in terms of evidentiary requirements, procedural safeguards, and resource constraints, which can affect their effectiveness in prosecuting environmental offenses. Moreover, criminal prosecutions may prioritize certain cases over others, leaving some environmental violations unaddressed

or under-penalized.

Overall, civil and criminal liability regimes are complementary tools in addressing climate change impacts, each with its strengths and weaknesses. By leveraging both civil and criminal legal mechanisms strategically, policymakers, regulators, and law enforcement authorities can enhance environmental protection efforts, promote sustainability, and hold accountable those responsible for contributing to climate change.

9. POLICY IMPLICATIONS

The examination of civil liability for climate change across different jurisdictions, including the USA, UAE, and various European jurisdictions, reveals significant policy implications and underscores the need for targeted reforms and international cooperation (Bruckner, B., Edenhofer, O., Koch, N., Steckel, J. 2023) to enhance accountability for climate change impacts. Drawing upon real-life data and expert analyses, this section discusses the policy implications arising from the analysis and provides recommendations for legal reforms, enforcement strategies, and international cooperation.

The analysis of civil liability for climate change highlights several key policy implications:

USA: In the USA, where climate change litigation has seen significant activity (Michael B. Gerrard and John C. Dernbach, Environmental Law Reporter (2019), policy implications include the need for:

- **Clearer Legal Standards:** Clarifying legal standards for establishing causation and liability in climate change litigation can provide greater certainty for litigants and courts.
- **Access to Justice:** Ensuring equitable access to justice for communities impacted by climate change requires addressing jurisdictional obstacles, procedural hurdles, and barriers to legal aid.

UAE: In the UAE, where civil liability principles may be influenced by Islamic law (Sharia) and specific environmental regulations, policy implications include:

- **Enhancing Legal Frameworks:** Strengthening environmental laws and regulations to explicitly address civil liability for climate change impacts can provide a clearer legal basis for litigation and enforcement actions.
- **Capacity Building (Law No. 24 of 1999).** Building judicial capacity and expertise in environmental law and climate change issues

can improve the effectiveness of the legal system in addressing climate-related disputes.

European Jurisdictions: In European jurisdictions, where climate change litigation has gained traction, policy implications include:

- **Coordinated Action:** Promoting international cooperation and information sharing among European countries (EU ETS) can facilitate coordinated enforcement efforts and enhance accountability for cross-border climate change impacts.
- **Harmonization of Laws:** Harmonizing legal standards and procedures across European Union member states (James W. Coleman, 2019) can streamline litigation processes and promote consistency in addressing climate-related disputes. (European Commission's Climate Action website).

10. CONCLUSION AND SUMMARY

This research has assessed the capacity of civil and criminal liability to deliver meaningful accountability for climate-change-related harm through a comparative analytical study of the United States, the United Arab Emirates, and European jurisdictions. It confirms that climate harm cumulative, transboundary, and scientifically complex challenges traditional liability models, yet recent litigation and enforcement trends demonstrate a tangible shift from political commitments to increasingly justiciable and enforceable claims.

On the civil liability track, established doctrines particularly negligence, nuisance, and (in more limited settings) strict liability and trespass remain the principal pathways for climate claims. Their effectiveness depends chiefly on how legal systems recalibrate duty of care and causation to accommodate multi-actor contribution and long-term risk. In this respect, attribution science and emissions-accounting methods can strengthen evidentiary narratives, but they also raise questions about admissibility, standards of proof, and remedy design. The comparative analysis further shows that defendants routinely rely on threshold and structural defense standing, justiciability, political-question arguments, and displacement/pre-emption highlighting the persistent tension between adjudication and policymaking in climate governance.

With respect to criminal liability, the study finds that criminal law can provide strong deterrence and expressive condemnation for serious environmental misconduct, especially where climate relevance is linked to discrete offences such as unlawful releases,

hazardous-waste violations, or falsified monitoring and reporting. However, criminal prosecutions face heightened constraints: proof beyond a reasonable doubt, statute-specific mens rea requirements, and intensive technical and institutional capacity needs. Consequently, criminal enforcement is most viable when directed at clearly criminal, high-culpability conduct rather than diffuse, system-wide emissions in the abstract.

The overarching implication is that effective climate accountability requires an integrated approach: civil mechanisms to support compensation and injunctive relief, and criminal mechanisms to address egregious misconduct both reinforced by credible monitoring and verification, specialized judicial capacity, and cross-border cooperation for transnational harms and multinational defendants. Ultimately, the law's central task is not merely to recognize climate harm, but to operate proportionate standards that identify responsible actors, establish contribution with scientific rigor, and deliver enforceable remedies consistent with the rule of law.

11. RECOMMENDATIONS

After examining civil and criminal liability for climate change related matters, and discussing the relevant legal theories in the United States, the United Arab Emirates, and the European Union, the study recommends adopting the following:

- To clarify climate-related civil liability standards (duty of care, foreseeability, and contribution-based causation) through legislative guidance and higher-court principles.
- To establish clear evidentiary frameworks for climate cases, including admissibility standards for attribution science, emissions accounting, and expert testimony.
- To strengthen access to justice by reducing procedural barriers (standing, limitation periods, forum disputes), expanding legal aid, and enabling representative/collective actions where appropriate.
- To enhance remedies by combining compensation with forward-looking relief (injunctions, remediation, and compliance orders) tailored to climate harm.
- To improve corporate accountability through mandatory climate-risk disclosure, enforceable anti-greenwashing rules, and board-level governance duties linked to climate risk management.
- To build judicial and enforcement capacity via

specialized training, expert registries, and dedicated environmental/climate benches or units where feasible.

- To prioritize criminal prosecution for high culpability, conduct with clear elements (illegal dumping, hazardous releases, monitoring tampering, and falsified reporting) rather than diffuse emissions alone.
- To calibrate penalties and sentencing to deter misconduct and restore harm, including disgorgement of economic benefit, remediation obligations, and proportional corporate fines.
- To strengthen monitoring, reporting, and verification (MRV) systems to produce reliable data for both civil and criminal proceedings.
- To harmonize cross-border rules on jurisdiction and applicable law, and to facilitate recognition and enforcement of judgments against multinational defendants.
- To expand international cooperation through mutual legal assistance, regulator-to-regulator information sharing, and coordinated investigations for transboundary environmental crime.
- To integrate civil, administrative, and criminal mechanisms into a coherent enforcement strategy with transparent criteria for escalation and consistent outcomes

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