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Climate Accountability and Environmental Rule of Law: Strengthening Legal Mechanisms for Ecological Protection in the Anthropocene

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Abstract

This paper develops an integrated account of climate accountability as a constitutive element of the environmental rule of law in the Anthropocene, an epochal framing that emphasizes the scale, systemic character, and irreversibility risks of human-driven Earth-system transformation. The Anthropocene framing, initially popularized in Earth-system science, underscores that environmental governance is no longer primarily about localized pollution control but about stabilizing biophysical conditions necessary for human security and ecological integrity.

The argument proceeds from a core diagnosis: environmental and climate legal regimes frequently exhibit an “implementation gap” in which sophisticated norms exist “on the books” but do not reliably translate into compliance, enforcement, or remedial outcomes. The environmental rule of law lens, advanced in authoritative form by the United Nations Environment Programme, treats legality, institutional capacity, public participation, access to justice, transparency, and accountability not as background conditions but as governance variables that materially determine ecological outcomes.

The paper synthesizes three doctrinal families that increasingly structure climate accountability:

First, public and constitutional law duties for climate protection (including statutory duties to plan, to give reasons, and to act consistently with legally defined objectives), illustrated in Europe by rights- and rule-of-law-based review of mitigation ambition and planning specificity (e.g., the Netherlands and Ireland).

Second, rights-based environmental protection through human rights law, increasingly mainstreamed in climate law instruments and interpretive guidance. The Paris Agreement preamble explicitly calls upon Parties, when addressing climate change, to respect and consider human rights and intergenerational equity, and notes “climate justice” as a relevant conceptual anchor.

Third, market- and information-based accountability, including carbon pricing and climate risk disclosure. The World Bank’s 2020 synthesis shows both the scale and the limitations of carbon pricing at that time: a growing number of instruments had been implemented or scheduled, yet a large share of covered emissions remained priced well below levels likely to drive deep decarbonization.

Comparatively, the analysis focuses on the EU, India, and the United States. It shows that: (i) European jurisdictions and institutions have generated influential judicial doctrines linking the rule of law to enforceable climate obligations, but remain constrained by standing rules at the EU level; (ii) India has built a robust environmental constitutionalism anchored in the right to life and a precautionary/polluter-pays synthesis, yet climate-specific adjudication still faces justiciability and institutional design limits; and (iii) the United States exhibits strong statutory-enforcement and administrative-law pathways but fragmented climate accountability across federalism, tort displacement, and political contestation. –

The paper concludes with a reform agenda aimed at converting climate commitments into rule-of-law-grade obligations: legally operational targets, transparent pathways, justiciable planning standards, aligned market instruments, corporate due diligence and disclosure duties, and remedial architectures capable of addressing both prevention and reparation..

Keywords: *Climate Justice; Climate Risk Disclosure; Comparative Environmental Law.*

Introduction

The Anthropocene presents environmental law with a problem of legal form: climate change is simultaneously cumulative, transboundary, scientifically complex, and governance-dependent, while legal institutions remain territorially bounded and often calibrated for discrete violations. The foundational international climate architecture nonetheless embeds a rule-like objective and principles. Under the UNFCCC, Parties accept an “ultimate objective” of stabilizing greenhouse gas concentrations to prevent “dangerous anthropogenic interference” with the climate system, and they endorse precautionary measures even amid scientific uncertainty, alongside cost-effectiveness considerations. The Paris Agreement strengthens this architecture through a temperature goal (well below 2°C, pursuing 1.5°C), iterative nationally determined contributions (NDCs), “highest possible ambition,” and transparency mechanisms, while situating climate action within sustainable development and human-rights considerations.

Yet the central governance puzzle is not whether climate law exists; it is whether climate law can be made accountable, that is, capable of generating legally cognizable duties, measurable performance, reviewable reasons, and enforceable remedies. This paper uses the environmental rule of law as an anchoring framework and asks how climate accountability can be made an operational component of that framework rather than a discretionary policy aspiration.

Research questions.

What institutional and doctrinal conditions convert climate obligations into enforceable legal duties consistent with the environmental rule of law? How do rights-based doctrines (public trust, constitutional and human rights) interact with market instruments (carbon pricing, emissions trading, and disclosure) to produce or undermine accountability? How do these dynamics compare across the EU, India, and the United States?

Objectives.

The objectives are fourfold: to (i) systematize “climate accountability” as a rule-of-law concept; (ii) map the doctrinal inventory that courts and regulators deploy to translate climate science into legal duties; (iii) compare EU, Indian, and U.S.

pathways and constraints; and (iv) propose a reform blueprint integrating rights-based and market-driven tools under a unified governance model that preserves democratic legitimacy while improving ecological effectiveness.

Literature Review

The literature on environmental governance and accountability converges around a shared insight: legal instruments succeed when institutions, courts, regulators, oversight bodies, and publics, can translate norms into compliance under conditions of uncertainty and political pressure. The UNEP articulation of environmental rule of law emphasizes that implementation depends on access to information, participation, justice, and enforcement capacity, not solely on the presence of environmental statutes.

A second strand situates these institutional problems within Earth-system stress and “planetary boundaries” thinking. The claim is not that law must internalize scientific frameworks wholesale, but that the scale and nonlinearity of climatic risk challenge legal categories premised on incremental harm and individualized causation. This is echoed by Earth-system governance scholarship that argues for legal paradigms attentive to systemic feedbacks and irreversible tipping points. ,

A third literature addresses rights-based environmental protection. Historically, global environmental law articulated proto-rights in instruments such as Stockholm (1972), which framed a right to adequate living conditions in an environment of a quality permitting dignity and well-being, and Rio (1992), which advanced public participation (Principle 10) and precaution (Principle 15). , Rights-based environmental law now appears in major climate instruments: the Paris Agreement preamble directs Parties to consider human rights, indigenous peoples’ rights, and intergenerational equity in climate action and explicitly notes climate justice. The United Nations Human Rights Office of the High Commissioner has further consolidated doctrinal expectations through Framework Principles on Human Rights and the Environment, emphasizing State duties to ensure a safe, clean, healthy, and sustainable environment as a condition for human-rights enjoyment.

A fourth literature concerns market instruments and climate finance. Carbon pricing, via emissions

trading systems (ETS) and carbon taxes, has expanded, but its governance legitimacy depends on distributive design, transparency, and enforcement. The World Bank's 2020 synthesis documents a global architecture of carbon pricing instruments and revenues, but also signals a central limitation: many covered emissions are priced at levels likely insufficient to shift investment and behavior at the pace required for Paris-consistent pathways.

Finally, corporate accountability scholarship increasingly links climate governance to the regulation of private power. Here, "state duty" and "corporate responsibility" frameworks operate as complementary pillars. The UN Guiding Principles on Business and Human Rights (UNGPs) clarify that States must protect against human-rights abuses by third parties (including business enterprises) through law and adjudication, while also emphasizing remedy. In parallel, securities and disclosure regimes increasingly function as climate accountability tools: the U.S. Securities and Exchange Commission interpretive guidance on climate disclosure frames climate-related impacts (including severe weather risks) as potentially material to investors and thus within the ambit of existing reporting duties.

Theoretical Framework and Methodology

This paper links environmental rule of law to climate accountability through a three-level framework: normativity, institutions, and performance.

At the normative level, climate governance is rooted in (i) international objectives and principles (UNFCCC objective; Paris temperature goal; precaution; equity), (ii) domestic constitutional and statutory objectives (right to life; duties to plan and act consistently with long-term transition objectives), and (iii) rights-based constraints and enabling conditions (human rights, procedural environmental rights).

At the institutional level, environmental rule of law requires that duties be assigned to identifiable actors; that information be produced and disclosed; that participation and access to justice exist; and that enforcement and remedies are credible. The UNEP account makes the implementation gap central: weak compliance capacity and limited access to justice can render ambitious environmental law performative rather than effective.

At the performance level, climate accountability is operationalized through measurable outcomes: emissions trajectories, adaptation readiness, disclosure compliance, and remedial relief. Market instruments, carbon pricing and trading, can contribute where they create real incentives and revenues aligned with social justice constraints, but they can also obscure responsibility if treated as a substitute for enforceable baseline duties.

Methodology.

The paper uses a mixed doctrinal and comparative methodology, with three components.

First, doctrinal analysis: interpretation of primary legal texts (treaties, statutes, constitutional provisions, and judgments) to identify duty structures, enforceability, and remedial architecture. Key treaty materials include the UNFCCC and Paris Agreement; key judicial materials include climate judgments and foundational environmental constitutionalism decisions. —, —, —

Second, comparative analysis: structured comparison across the EU, India, and the United States to identify how different constitutional structures, standing rules, and regulatory cultures shape accountability pathways.

Third, policy analysis: evaluation of instrument mixes (command-and-control, rights-based duties, market instruments, disclosure) against rule-of-law criteria, legality, transparency, participation, and remedy, that bear on legitimacy and effectiveness.

Comparative Case Studies

Comparative visual orientation





EU and European jurisdictions

European climate accountability illustrates both the power and limits of judicial review under rule-of-law conditions. In the Netherlands, the Supreme Court of the Netherlands upheld an order requiring the State to achieve at least a 25% greenhouse gas reduction by the end of 2020 (relative to 1990), grounding the obligation in duties under Articles 2 and 8 of the ECHR as interpreted through domestic constitutional mandates to apply Convention rights. The Court framed judicial protection against government as “an essential component of a democratic state under the rule of law,” while leaving policy choice of measures to the political branches.

In Ireland, the Supreme Court of Ireland held that a statutory climate plan must meet a legally mandated

standard of specificity. The Court concluded that a national mitigation plan that fails to comply with statutory requirements, particularly the duty to “specify” how a legally defined transition objective will be achieved, should be quashed. This is a paradigmatic rule-of-law approach: policy becomes justiciable when the legislature converts policy aspiration into legal obligation, and judicial review focuses on legality and reasons rather than substituting the court’s preferred climate policy.

At EU institutional level, standing and access to justice remain structural constraints. In *Carvalho (People’s Climate Case)*, the General Court dismissed an action challenging parts of the EU’s climate-and-energy package as inadmissible because applicants failed to satisfy the “individual concern” requirement. The case is doctrinally significant precisely because it illustrates a paradox of diffuse harm: the broader and more generalized climate impacts are, the harder it becomes for individuals to access supranational judicial review absent legislative relaxation of standing or procedural innovations.

At the level of substantive EU law, climate accountability draws on a treaty-based environmental policy architecture. Article 191(2) TFEU embeds precaution, preventive action, rectification at source, and polluter pays as principles of EU environmental policy, these principles provide normative scaffolding for both regulatory and market instruments. The EU ETS Directive institutionalizes a carbon market as a core mitigation tool, translating EU climate targets into tradable allowances and compliance obligations. The Governance Regulation (EU) 2018/1999 adds planning, reporting, and review structures (national energy and climate plans and monitoring), reinforcing the accountability dimension of climate governance through iterative information and oversight loops.

India

India provides a leading example of environmental constitutionalism and doctrinal innovation through public interest litigation, with doctrines that are readily “climate-capable” even when cases are not explicitly framed as climate litigation.

In *Subhash Kumar v State of Bihar*, the Supreme Court of India held that the right to life under Article 21 includes the right to enjoyment of pollution-free

water and air, and that Article 32 may be invoked for preventing pollution where quality of life is endangered. This is foundational for climate accountability because it locates environmental quality within fundamental rights and constitutional remedies.

In *Vellore Citizens Welfare Forum v Union of India*, the Supreme Court integrated the precautionary principle and polluter-pays principle into domestic environmental law and linked remediation to sustainable development. The Court gave a structured account of precaution (anticipate and prevent degradation; scientific uncertainty cannot justify postponement; burden on the actor to show benignity) and framed polluter-pays to include restoration of environmental degradation. This doctrinal package is highly relevant to climate accountability because it supplies a legal logic for preventive regulation and remedial finance in the face of systemic ecological risk.

Indian climate-specific adjudication illustrates both potential and limits. In *Ridhima Pandey v Union of India*, the National Green Tribunal declined to issue broad directions to create a national carbon budget or climate recovery plan, reasoning that climate change issues are covered within the environmental impact assessment scheme under existing environmental law and that there was no reason to presume international climate commitments were not reflected in policy and clearances. The order is significant because it shows a judicial preference for channeling climate governance through existing administrative processes rather than creating new climate duties via adjudication, an approach with rule-of-law virtues (institutional role clarity) but also potential accountability gaps if administrative processes are not themselves climate-robust.

United States

The United States provides a distinct accountability architecture grounded in statutory delegation, administrative rulemaking, and judicial review. In *Massachusetts v EPA*, the Supreme Court of the United States treated greenhouse gases as within the regulatory scope of the Clean Air Act's mobile-source provision and rejected the EPA's categorical refusal to determine whether greenhouse gases endanger public health or welfare. The case is foundational because it constitutes a legal hinge from policy discretion to statutory duty: once the

statute's criteria are met, the agency must ground action or inaction in legally acceptable reasons.

In *American Electric Power v Connecticut*, the Supreme Court held that federal common law nuisance claims seeking judicially imposed emissions caps were displaced by the Clean Air Act's regulatory scheme, emphasizing Congress's delegation to the agency and the statute's enforcement avenues (including public and private enforcement mechanisms) as the proper accountability pathway. The case thus illustrates both constraint and channeling: courts may curtail common-law climate tort avenues at federal level while consolidating accountability in administrative law and statutory enforcement.

The U.S. climate accountability ecosystem also increasingly includes corporate accountability through disclosure and investor-protection regimes. The SEC's interpretive guidance on climate disclosure reminds registrants that climate risks and consequences, including severe weather and climate-related events, may be material and thus require disclosure under existing securities law frameworks. This is a distinct accountability modality: rather than direct emissions control, it operates through information, market discipline, and liability for misstatements or omissions.

Critical Analysis Integrating Rule-of-Law Principles with Climate Accountability Mechanisms

The comparative analysis supports a central proposition: climate accountability is best understood as environmental rule of law applied to a cumulative, systemic harm. It requires translating climate objectives into (i) duties to plan and implement, (ii) duties to disclose and justify, and (iii) duties to remedy harms and prevent foreseeable risks.

Rule-of-law functions served by climate accountability

First, climate accountability serves the legality function, ensuring that executive climate policy is constrained by law rather than treated as purely discretionary. The Irish and Dutch cases show two complementary models. One model constitutionalizes climate protection through rights duties and judicial review of minimum mitigation thresholds while preserving legislative discretion in

policy instruments. Another model converts policy to law via statutory planning duties, making inadequate specificity a legal defect rather than a political disappointment.

Second, climate accountability serves the transparency and reason-giving function. The Paris Agreement embeds transparency as a governance principle, and its preambular emphasis on participation and access to information resonates with broader procedural environmental rights principles in global environmental law. – Domestic analogues include the use of disclosure regimes, as in U.S. securities law guidance treating climate effects and exposures as potentially material.

Third, climate accountability serves the remedial function. Without remedies, climate law risks becoming hortatory. Rights-based action can provide injunctive and structural remedies, as in Urgenda’s minimum-reduction order. Statutory review can provide remedy by invalidating noncompliant plans, as in Ireland’s quashing of a mitigation plan. Conversely, EU-level standing restrictions in Carvalho show how remedial access can be structurally blocked even when harms are foreseeable, an access-to-justice deficit inconsistent with the strongest conceptions of environmental rule of law.

Rights-based duties and corporate accountability

Rights-based climate accountability draws strength from its ability to frame climate change as a threat to life, health, and dignity. The Paris Agreement’s human-rights language and “climate justice” framing provide interpretive leverage for domestic constitutional and administrative arguments, even if not self-executing. In India, the right-to-life jurisprudence explicitly includes pollution-free air and water and thus supports climate arguments where greenhouse gas emissions and climate impacts degrade the conditions of life.

However, rights-based litigation can face institutional pushback: courts may insist on standing, justiciability, and separation of powers limits. This is visible in Ireland, where the Court explored the boundaries of “derived” environmental rights while still providing statutory relief. It is also visible at EU level, where generalized harm undermines “individual concern.”

Corporate accountability becomes crucial where state action alone is insufficient to manage emissions trajectories and adaptation burdens. The UNGPs articulate a governance baseline: States must protect against human-rights abuse by third parties, including business, through legislation and adjudication; rule-of-law values (accountability, legal certainty, transparency) are explicit in the commentary. While the UNGPs are not climate-specific, they supply a legal and moral architecture for climate-related due diligence, particularly where corporate activity generates foreseeable harms affecting rights to life, health, and livelihood.

Market instruments and the risk of “accountability substitution”

Market instruments can deepen accountability when they are embedded in rule-of-law architectures: clear caps or tax rates, transparent monitoring, credible sanctions, and fair distributional measures. The EU ETS demonstrates how law can create a compliance market for emissions reductions, thereby integrating economic incentives into legal obligation. The World Bank’s 2020 assessment indicates that carbon pricing revenues can be substantial and can be directed toward environmental or developmental projects, reinforcing the legitimacy and distributive capacity of carbon pricing when well-designed.

Yet carbon pricing also risks accountability substitution: substituting price mechanisms for the hard work of defining enforceable duties, ensuring compliance, and providing remedies. The rule-of-law concern is that pricing can become a justification for continued emissions if caps are weak, prices are low, exemptions are broad, or enforcement is lax. The 2020 global picture, many instruments, but a significant share of covered emissions priced at low levels, suggests that market instruments alone are insufficient to secure Paris-aligned transformation absent legally enforceable ambition and disciplining institutions.

Integrated synthesis: accountability as structured governance loop

A robust climate accountability system integrates rights-based and market-based tools into a governance loop:

1. Duties and targets are legally defined (internationally and domestically);

- 2.Plans and pathways specify how targets will be achieved;
- 3.Instruments (regulatory standards, carbon pricing, disclosure) implement pathways;
- 4.Monitoring and transparency enable review;
- 5.Enforcement and remedies correct deviations; and

6.Iterative review updates ambition consistent with “highest possible ambition” and precaution.

This is consistent with the Paris Agreement’s ambition and progression logic. It is also coherent with environmental rule-of-law theory, which foregrounds institutions and enforcement rather than aspirational norms.

Comparative tables

Table: Regulatory instruments, accountability logics, and rule-of-law requirements

Instrument type	Primary legal mechanism	Accountability logic	Rule-of-law requirements for effectiveness
Statutory climate planning	Legislated duty to adopt plans meeting defined criteria	Courts review legality and reasons; plans become enforceable	Specificity requirements; transparency; reviewability; remedies (e.g., quashing)
Rights-based claims (ECHR/constitutional)	Positive obligations to protect life/private life; constitutional rights	Minimum floors and due diligence review	Standing rules compatible with diffuse harms; proportional remedies; separation-of-powers sensitivity
ETS (cap-and-trade)	Legal cap + tradable allowances + sanctions	Compliance through market + enforcement	Reliable MRV, anti-fraud, predictable policy, fair allocation/revenue use
Carbon tax	Statutory price per tCO _{2e} + fiscal enforcement	Behavioral incentives + revenue recycling	Equity design; coverage; administrative capacity; transparency of revenue use
Climate risk disclosure	Securities law and fiduciary duty frameworks	Investor protection and market discipline	Materiality guidance; enforcement against misstatements; standardized reporting channels
Impact assessment integration	EIA/SEA statutes and regulations	Ex ante screening of climate impacts	Climate-scoping requirements; data integrity; procedural rights; judicial review

Table: Doctrines and institutional constraints across jurisdictions

Dimension	EU / European jurisdictions	India	United States
Rights-based climate accountability	Strong in some national courts (e.g., ECHR-informed duties); EU-level standing tight	Environmental constitutionalism via Article 21; climate-specific rights claims still developing	Constitutional rights claims face standing/political question constraints; statutory pathways dominate
Public trust / fiduciary ecology	Present in some jurisdictions as constitutional/administrative principles	Public trust and intergenerational equity strongly judicialized in environmental cases	Public trust exists at state level; federal doctrine contested; climate tort paths constrained
Primary accountability pathway	Litigation + statutory planning + EU governance regulation	PIL + specialized tribunal + precaution/polluter-pays jurisprudence	Administrative law + statutory delegation; tort displacement at federal level
Structural constraint	EU locus standi (individual concern) barriers	Climate governance often channeled through EIA and general environmental law	Federalism fragmentation; agency rulemaking contestation

Table: Jurisdictional outcomes as of 2020

Jurisdiction	Illustrative outcome	Accountability gain	Persistent gap
Netherlands	Court-ordered minimum mitigation by 2020	Rights-based enforceable floor; rule-of-law justification	Implementation depends on executive measures; long-term pathways remain political
Ireland	Plan quashed for lack of statutory specificity	Transforms climate planning into justiciable legal duty	Rights-based claims constrained by standing; subsequent plan quality remains political
EU institutions	<i>Carvalho</i> inadmissible	Clarifies access-to-justice barrier	Diffuse climate harms struggle to access EU judicial remedies
India	Strong environmental rights doctrine; NGT climate petition disposed through EIA channel	Doctrinal base supports climate-capable adjudication	Climate-specific duty articulation limited; administrative climate integration uneven
U.S.	CAA interpreted to allow/require GHG	Channels climate accountability into	Implementation depends on agency

	regulation; federal nuisance displaced	statutory/regulatory pathway	action; common-law accountability narrowed at federal level
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Comparative case studies

The case studies assess how each jurisdiction combines (a) command-and-control regulation, (b) rights-based environmental law, and (c) market-driven instruments, and what institutional constraints and opportunities follow.

In the European Commission's environmental governance framework, EU treaty law provides foundational principles and an express "high level of protection" orientation. Article 191(2) TFEU grounds EU environmental policy in precaution, prevention, rectification at source, and polluter pays. The EU operationalizes these principles through layered directives and regulations: the Industrial Emissions Directive establishes integrated pollution prevention and control rules for industrial installations, while the Environmental Liability Directive explicitly adopts a polluter-pays framework for prevention and remediation of environmental damage. Procedural rights are institutionalized through the Aarhus Convention (to which the EU is a party) and through internal EU law applying Aarhus pillars to EU institutions. The EU's rights-adjacent layer is further underscored by Article 37 of the EU Charter, which requires integration of environmental protection into EU policies in accordance with sustainable development.¹

Market-driven governance in the EU is exemplified by the EU Emissions Trading System, established by Directive 2003/87/EC as a cap-and-trade scheme for greenhouse gas allowances. The legal design of the EU ETS, cap setting, allocation, monitoring, compliance penalties, illustrates the core claim that "market" tools are legally constituted by command structures. The EU also supplies doctrinal and institutional integration points: EU ETS design is linked to broader EU environmental principles and to policy integration obligations. Descriptive monitoring of emissions trends under the EU ETS has been published by the European Environment

Agency, including analyses of historical verified emissions and projections.²

In India, the constitutional and judicial development of environmental rights is central. The Constitution includes directive principles and fundamental duties relevant to environmental protection, and judicial interpretation has extended the right to life to include the enjoyment of pollution-free water and air. The Supreme Court case *Subhash Kumar v State of Bihar* articulates that Article 21 includes the right to enjoy pollution-free water and air for full enjoyment of life. The Supreme Court of India has also institutionalized core environmental principles (precaution, polluter pays, sustainable development) in *Vellore Citizens Welfare Forum v Union of India*, and has recognized public trust duties in *M.C. Mehta v Kamal Nath*. It has further articulated robust fault standards for hazardous activities, developing the doctrine of absolute liability in *M.C. Mehta v Union of India (Oleum Gas Leak)*. These judge-made doctrines operate as functional rights-based constraints and duties that shape administrative action, compensation, and remediation.

India's statutory framework remains largely command-and-control and permit-centric, including the Water Act (1974), Air Act (1981), and Environment (Protection) Act (1986). The EIA Notification (2006), issued under the Environment (Protection) Act, establishes prior environmental clearance requirements and institutional appraisal structures, illustrating procedural governance and administrative discretion under legal constraints. The creation of the National Green Tribunal through the National Green Tribunal Act, 2010 forms an institutional bridge between rights

¹ Charter of Fundamental Rights of the European Union, Art. 37 (Environmental protection).

² European Environment Agency, *The EU Emissions Trading System in 2019: Trends and Projections* (2019).

and enforcement by enabling specialized adjudication and relief for environmental harms.³

Market-driven instruments in India are selective and frequently hybridized. A prominent example is the energy efficiency trading mechanism under the PAT scheme administered by the Bureau of Energy Efficiency, which combines regulatory targets with tradable Energy Saving Certificates, aiming to improve cost-effectiveness of energy reduction obligations. India has also used fiscal instruments aligned with polluter-pays logic, such as the coal cess funding the National Clean Energy and Environment Fund. Pilot cap-and-trade initiatives for local industrial air pollution have emerged (e.g., Surat's particulate trading project), reflecting experimentation with market structures in a context of enforcement constraints; early descriptive accounts predate later evaluation work and indicate a policy objective of reducing particulate pollution through tradable permits.⁴

In the United States, the legal architecture of environmental governance has long been structured by federal command-and-control statutes supplemented by litigation-enabling procedural rights. The Clean Air Act's congressional findings and purposes codify federal authority and objectives for air quality protection and pollution control. NEPA establishes a national policy to encourage "productive and enjoyable harmony" between humans and the environment and institutionalizes environmental impact assessment processes in federal decision-making. The enforcement ecosystem is materially shaped by citizen suit provisions, which allow private persons to bring civil actions under specified conditions (e.g., Clean Air Act citizen suits) and thereby supplement administrative enforcement.⁵

Market-driven instruments in the United States have had influential sectoral applications. The U.S. Environmental Protection Agency describes the Acid Rain Program as a Title IV Clean Air Act program requiring major SO₂ and NO_x reductions, using a cap-and-trade design for SO₂. A key official

report explains that SO₂ reductions were "largely achieved through a market-based cap and trade program" under Title IV, illustrating how legal design structures market trading as a compliance pathway [31]. State-level carbon markets include the Regional Greenhouse Gas Initiative, structured through model rules establishing monitoring and compliance and beginning compliance in 2009 [35]. California's cap-and-trade program began in 2013 under AB 32 implementation, as described by the California Air Resources Board.⁶

Rights-based environmental law in the U.S. is more fragmentary at the federal level but exists through public trust doctrinal roots and through state constitutional developments. *Illinois Central Railroad v Illinois* remains foundational for the notion that certain submerged lands and analogous resources are held in trust, limiting alienation inconsistent with public use. Contemporary rights-based constitutional reasoning in some U.S. states is exemplified by *Robinson Township v Commonwealth of Pennsylvania*, which invigorated the Environmental Rights Amendment and framed constitutional environmental obligations as constraints on statutory choices. Climate-change-related governance development is also shaped by judicial interpretation of statutory authority: *Massachusetts v EPA* held that greenhouse gases fall within the Clean Air Act's concept of "air pollutant" for purposes of EPA regulatory authority and addressed standing and reviewability.⁷

The three jurisdictions thus display different "integration profiles": the EU's strong supranational administrative architecture and treaty principles; India's rights-driven judicial development and hybridization under administrative capacity constraints; and the U.S. combination of statutory command frameworks, procedural litigation, and selective market instruments.

³ Environmental Impact Assessment Notification, 2006 (S.O. 1533(E), 14 Sept 2006) (India).

⁴ IndiaSpend, "Surat's Emission Trading Project..." (2019) (descriptive account of particulate trading pilot).

⁵ Robert Baldwin; Julia Black, "Really Responsive Regulation" (2008) 71(1) *Modern Law*

⁶ California Air Resources Board, AB 32 Global Warming Solutions Act of 2006 (Fact sheet, 2018) (cap-and-trade begins 2013).

⁷ *Massachusetts v EPA*, 549 U.S. 497 (2007).

Doctrinal element	European Union	India	United States
Constitutional / quasi-constitutional environmental principles	Treaty principles (precaution, prevention, polluter pays) and policy integration obligations	Constitutional directives/duties and Article 21 jurisprudence (right to pollution-free air/water)	No federal constitutional environmental right; state-level rights in some jurisdictions
Public trust governance of commons	Present but mediated through EU institutional structure; trust-like principles arise in environmental integration and liability norms	Expressly adopted in Supreme Court jurisprudence (e.g., M.C. Mehta v Kamal Nath)	Foundational doctrine in Illinois Central; variable state development
Procedural environmental rights	Aarhus Convention and EU implementing regulation for EU bodies	EIA clearance regime and tribunalization (NGT)	NEPA procedural duties; broad citizen suits in major statutes
Market instruments' legal dependence on command structures	EU ETS directive constitutes "market" via cap, allocation, MRV, penalties	PAT scheme constitutes market within regulatory target system	Acid Rain Program regulations and statutory architecture constitute trading market

Comparative doctrine table

Critical analysis and reform agenda

The comparative analysis supports three core claims: (i) command-and-control is necessary to constitute markets and to establish enforceable baselines; (ii) rights-based law is necessary to legitimize baselines and to constrain markets against commodification and distributive injustice; and (iii) market instruments can substantially improve cost-effectiveness and innovation incentives when embedded within credible monitoring and rights constraints.

Command-and-control as the constitutive substrate of markets

Cap-and-trade instruments are frequently described as "market approaches," but legally and institutionally they are command models that use trading as a compliance mechanism. The EU ETS Directive establishes a scheme whose existence depends on legal determinations of scope, cap logic, allowance definition, allocation, and enforcement.⁸ Similarly, the U.S. Acid Rain Program's cap-and-trade operation is disclosed in official reporting as a designed program with

permanent emissions caps and regulatory obligations.⁹ This matters normatively: without command-set caps or enforceable measurement, markets cannot be said to "solve" pollution problems; they operationalize public choices about permissible pollution and how costs of abatement are distributed.

The implication for legal design is that reform debates should not pose "command" versus "market" as mutually exclusive alternatives. Instead, the relevant question is how to construct a command baseline that is rights-consistent and then whether trading or taxation can meet that baseline more efficiently and with greater innovation incentives.¹⁰

Rights-based constraints as legitimacy conditions for market instruments

Rights-based environmental law influences governance through at least four channels.

First, it supplies substantive floors: in India, Article 21 jurisprudence explicitly ties environmental quality to the right to life, which functionally constrains administrative toleration of pollution. In the EU, treaty principles demand a high level of

⁸ Directive 2003/87/EC (EU ETS Directive) (2003).

⁹ U.S. Environmental Protection Agency, Acid Rain Program: 2005 Progress Report (2005).

¹⁰ Robert N. Stavins, "Market-Based Environmental Policies" (Resources for the Future Discussion Paper 98-26) (1998).

protection and embed precaution and polluter pays as policy foundations.¹¹ Such floors are not equivalent to specific numerical standards, but they supply legal reasons that can be invoked to challenge under-protective regulatory choices or weak enforcement.

Second, it supplies fiduciary constraints through the public trust doctrine. Illinois Central frames a category of state-held resources as subject to trust obligations that cannot be irrepealably conveyed contrary to public benefits; Sax's scholarship conceptualizes public trust as a doctrinal vehicle for effective judicial intervention where agencies fail to protect public resources. In India, the doctrine is explicitly adopted and articulated as restricting governmental authority to alienate or privatize resources that should remain for public enjoyment. This trust logic interacts problematically with market entitlements: tradable permits risk being treated as quasi-property and may entrench expectations against tightening. A rights-anchored model therefore requires explicit legal clauses clarifying the revocability and non-proprietary character of allowances and limiting the use of "offsets" where they would enable rights-violating local pollution hotspots.

Third, rights-based law institutionalizes procedural legitimacy. Aarhus-style access rights recognize that environmental governance decisions are information-intensive and value-laden; access to information, participation, and justice are therefore legally required to reduce arbitrariness and improve decision quality. The EU's internal application of Aarhus pillars to EU institutions illustrates how procedural regimes can be legally codified and institutionalized. India's EIA clearance regime similarly structures participation and appraisal, albeit under recurring critiques not addressed here empirically; doctrinally, it illustrates the state's recognition that environmental decisions require structured processes rather than purely discretionary administrative action.¹²

Fourth, rights-based law facilitates remedies and accountability. Citizen suit provisions in U.S. environmental statutes illustrate how procedural rights can make enforcement more credible by

enabling private attorneys general to compel compliance where agencies are inactive.¹³ This enforcement channel is especially relevant for market instruments because market credibility depends on compliance expectations; weak enforcement collapses allowance scarcity and price signals.

Market instruments as constrained implementation technologies

Market instruments offer two principal governance advantages when appropriately constrained: informational decentralization and innovation incentives. Stavins' analysis summarizes how market-based instruments can provide continuing incentives for firms to identify lower-cost abatement and technological improvements, in contrast to many technology standards that can lock in compliance pathways. Yet the rights-anchored model requires additional design constraints: (i) transparency and participation in cap-setting, (ii) distributional safeguards (especially where costs are passed through to consumers), and (iii) liability regimes that prevent markets from substituting away from remediation duties.

Carbon taxes and cap-and-trade instruments also reflect different risk allocations under uncertainty. Weitzman's "prices vs quantities" framework shows that the welfare properties of price instruments versus quantity instruments depend on relative slopes and uncertainty of marginal abatement costs and damages; a rights-based framing alters this calculus by treating some harm levels as unacceptable irrespective of welfare tradeoff. Therefore, where environmental rights are interpreted as imposing non-negotiable minima (e.g., local air quality standards linked to health rights), quantity-based constraints with local non-attainment protections may be preferable to purely price-based instruments.

For PES, the design literature highlights that PES is a tool tailored to contexts where ecosystem services are underprovided due to externalities and where conditional payments can realign incentives. Engel–Pagiola–Wunder stress that effectiveness depends crucially on design and that PES is not a universal

¹¹ Treaty on the Functioning of the European Union, Art. 191 (environmental principles).

¹² NEPA, 42 U.S.C. § 4321 (Congressional declaration of purpose).

¹³ to Justice in Environmental Matters (Aarhus Convention) (1998).

solution;¹⁴ Wunder’s earlier “nuts and bolts” similarly emphasizes definitional and implementation issues including conditionality, monitoring, and social effects. Within a rights-constraints on commons

anchored model, PES must be designed to avoid dispossession, ensure free and informed participation, and coordinate with public trust

Instrument comparison table

Instrument Type	Core Legal Structure	Main Advantage	Main Legal Risk	Rights-Anchored Safeguard
Command-and-control regulation	Statutory permits, standards, inspections, sanctions	Clear baseline control of pollution	Rigidity and uneven enforcement	Judicial oversight and constitutional rights review
Emissions Trading (ETS)	Legally fixed cap, tradable permits, monitoring and penalties	Cost-efficient pollution reduction	Weak caps and localized pollution hotspots	Ecological limits and local non-degradation safeguards
Carbon Taxes	Statutory tax rates, collection and revenue rules	Administrative simplicity and predictable pricing	Regressive impacts and political resistance	Revenue recycling and targeted rebates
Payments for Ecosystem Services (PES)	Contracts rewarding verified environmental services	Incentivizes conservation	Additionality failures and land conflicts	Equity safeguards, consent, and verification mechanisms

Jurisdictional outcomes table

Given the non-empirical methodological constraints of this paper, “outcomes” are treated descriptively and institutionally (design features and reported trends), rather than as causal estimates.

Jurisdiction	Market Instrument Example	Reported Trend / Claim	Rights & Accountability Link
EU	EU Emissions Trading System (ETS)	Verified emissions declines in the power sector since 2005	Treaty principles (precaution, polluter pays); Aarhus procedural rights
US	Acid Rain Program (SO ₂ trading)	Major SO ₂ reductions from 1980 levels through cap-and-trade	Citizen suits and judicial review mechanisms
India	PAT scheme (energy efficiency trading); coal cess	Tradable efficiency certificates and polluter-pays fiscal tool	Article 21 environmental rights and NGT remedies

¹⁴ Stefanie Engel; Stefano Pagiola; Sven Wunder, “Designing Payments for Environmental Services in

Theory and Practice: An Overview of the Issues” (2008) 65(4) Ecological Economics 663.

Policy Recommendations and Legal Reform Proposals

The reform agenda proposed here treats climate accountability as an environmental rule-of-law modernization project. The focus is on institutionalizing duty, transparency, reviewability, and remedy across the public and private spheres.

Legal duties and targets

First, enact or strengthen statutory duties to plan with enforceable specificity requirements. The Irish precedent demonstrates that specificity is not a technocratic preference but a legality condition for democratic accountability: the public cannot meaningfully participate in climate governance if plans do not disclose how objectives will be achieved. Legislatures should codify minimum plan content: sectoral pathways, interim targets, implementation measures, financing, and distributional impacts.

Second, codify minimum floors for mitigation consistent with precaution and intergenerational equity. The Dutch approach shows that rights-based floors can coexist with political discretion about the means. Legislatures can reduce separation-of-powers friction by adopting statutory floors themselves, thereby converting judicially implied minima into democratically enacted obligations.

Third, integrate human-rights language into domestic climate statutes and administrative guidance. The Paris Agreement's human rights and climate justice clauses provide a persuasive interpretive direction: climate policy should be assessed not only for aggregate emissions efficiency but for its impacts on vulnerable groups and intergenerational equity.

Access to justice and institutional design

Fourth, reform standing rules where climate harms are foreseeable but diffuse. The EU's "individual concern" model creates an access-to-justice deficit for systemic harms. Legal reform options include: broadened locus standi for qualified NGOs; climate actio popularis under defined statutory criteria; or specialized review procedures linked to statutory climate plans. Such reforms align with the procedural environmental rights logic reflected in the Aarhus tradition. ,

Fifth, enhance specialized adjudicative capacity. India's rights jurisprudence demonstrates doctrinal

readiness for climate accountability, but climate disputes require institutional capacity for scientific evidence, forecasting, and remedial design. Strengthening specialized tribunals' mandates to address climate-specific claims, while preserving boundaries of expertise and avoiding judicial overreach, can improve accountability.

Market instruments aligned with rule of law

Sixth, treat carbon pricing as compliance infrastructure rather than a symbolic policy. The World Bank's 2020 account indicates substantial carbon pricing revenues and a growing number of instruments, yet also underscores low effective prices across much coverage. Reform should focus on price floors, cap tightening, leakage controls, anti-fraud enforcement, and transparent revenue recycling aimed at social justice and political durability.

Seventh, hardwire MRV (monitoring, reporting, verification) requirements into carbon markets and permitting systems. Market instruments require reliable data and enforcement to avoid becoming deregulatory in effect. EU instruments have moved toward integrative governance and reporting structures, but institutional efficacy depends on auditability and sanctions.

Corporate duties and disclosure

Eighth, legislate climate-related due diligence obligations informed by the UNGPs. The UNGPs frame State duty to protect and corporate responsibility to respect human rights, with remedy as a third pillar. Translating this into climate governance implies: (i) mandatory climate risk and impact due diligence; (ii) board oversight duties and documented transition plans; and (iii) effective grievance and remediation pathways.

Ninth, strengthen climate disclosure as an accountability tool. The SEC's interpretive guidance demonstrates how existing securities law can treat climate-related impacts (including severe weather, operational disruption, and insurance cost changes) as potentially material. Jurisdictions should move toward standardized, enforceable disclosure that supports both investor protection and public accountability, with penalties for misleading statements.

Remedy and reparative justice

Tenth, expand remedial toolkits beyond injunctions to include restoration finance and adaptive protection. Indian jurisprudence's articulation of polluter-pays as including remediation and restoration suggests a doctrinal basis for climate-relevant remedies where specific actors can be linked to environmental degradation, including funding for adaptation and resilience in affected communities.

Conclusion

Climate law in the Anthropocene cannot be evaluated solely by counting treaties, targets, or market instruments. Its effectiveness depends on whether climate commitments are translated into enforceable duties, transparent planning, accessible review, and credible remedies, conditions captured by the environmental rule of law framework.

The comparative analysis shows complementary models. The Netherlands demonstrates rights-based minimum floors grounded in rule-of-law principles and human-rights duties, while Ireland demonstrates how statutory planning duties can convert climate ambition into justiciable legality constraints without collapsing democratic discretion. – India demonstrates a powerful environmental constitutionalism with doctrines directly relevant to climate accountability (precaution, polluter pays, and rights to pollution-free air and water), but also indicates that climate-specific governance may be administratively channeled unless legislatures sharpen climate duties. – The United States demonstrates the centrality of statutory delegation and administrative accountability: while federal tort pathways may be displaced, the Clean Air Act framework and judicial review can force agencies to engage in rule-governed decision-making on greenhouse gases. –

The deepest lesson is structural: climate accountability is not a single doctrine but a governance system. Rights-based and market-based approaches are not substitutes; they are complementary architectures that must be integrated under rule-of-law conditions. The Paris Agreement's "highest possible ambition" and progression logic and its explicit attention to human rights and climate justice provide the normative architecture for such integration. The task for domestic and regional legal orders is to construct institutions capable of translating that architecture into reliable, equitable, and enforceable ecological protection.

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