

Original Research

Received 25 May 2026

Revised 29 June 2026

Accepted 13 July 2026

Natural Resources for Human Health 2026, Vol. 6 (11s): 1582–1593

KEYWORDS:

Climate Justice, Natural Resources, Human Health, Environmental Law, Sustainable Development, Biodiversity.

The Future of Climate Justice: Integrating Environmental Philosophy, International Law and Sustainable Development Goals

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ABSTRACT: Climate change increasingly threatens natural resources that underpin human health, including clean water, food systems, medicinal biodiversity, healthy ecosystems and climate-regulating landscapes. At the same time, responsibility for greenhouse-gas emissions, exposure to environmental harm and access to adaptation resources remain unevenly distributed. This review integrates environmental philosophy, international law and the Sustainable Development Goals (SDGs) to develop a natural-resources-centred framework for climate justice and human health. A structured interdisciplinary narrative review was undertaken using major climate-science assessments, international legal instruments, judicial opinions, UN policy documents and peer-reviewed scholarship on environmental justice, ecosystem health, food and water security, biodiversity and just transition. The synthesis shows that distributive, procedural, recognitional, capabilities, intergenerational and ecological justice converge around five operational priorities: equitable burden sharing, meaningful participation, protection of health-supporting natural resources, intergenerational stewardship and accountable finance, technology and remedies. Recent international climate jurisprudence strengthens duties of prevention, due diligence, cooperation and science-informed action. Mapping these principles

onto SDGs 2, 3, 6, 7, 10, 12, 13, 14, 15, 16 and 17 demonstrates that climate justice is inseparable from sustainable management of natural resources and

prevention of climate-sensitive health risks. Future climate governance should therefore assess carbon outcomes together with water, food, biodiversity, ecosystem-service and health-equity indicators.

1. INTRODUCTION

Climate change is simultaneously a biophysical process, a distributive conflict, a human-rights challenge, a development constraint and an ecological crisis. The physical mechanism is global, but responsibility, exposure, adaptive capacity and access to remedies are profoundly unequal. The IPCC emphasizes both the unequivocal human causation of contemporary warming

and unequal historical and continuing contributions associated with energy use, land use, consumption and production. This asymmetry is the starting point of climate justice: those who have contributed least to the problem often face severe effects, while those with greater resources generally possess stronger capacity to protect assets, relocate, insure losses and influence policy. Climate justice therefore asks not only how rapidly emissions should fall, but who should act, who should pay, whose knowledge counts, whose losses are recognized and what is owed to future generations and the living systems on which human societies depend. The 2030 Agenda adds a second layer. The SDGs are integrated and indivisible, linking poverty, health, food, water, energy, inequality, cities, consumption, climate action, oceans, terrestrial ecosystems, institutions and international partnership. Climate policy can advance these goals, but poorly designed transitions can create new inequities through land-intensive mitigation, regressive energy pricing, displacement, exclusionary conservation or mineral extraction that transfers environmental burdens to marginalized regions. A justice-centred approach is needed to distinguish climate action that merely changes technologies from climate-resilient development that also changes the distribution of risks, capabilities and decision-making power.

This challenge is especially relevant to animal-environment scholarship. Climate change alters habitat ranges, migration, reproduction, food webs, disease ecology, wildfire exposure, marine chemistry and the availability of water and forage. Yet mainstream climate-justice scholarship remains predominantly anthropocentric. The moral status of animals, intrinsic and relational value of ecosystems, and consequences of climate responses for biodiversity are often treated as secondary co-benefits. This article argues that future climate justice requires a more-than-human turn: a framework that respects human rights while recognizing that justice cannot be ecologically durable if it permits systematic destruction of habitats, species and animal welfare. The article makes three contributions. First, it integrates environmental philosophy with contemporary international legal developments. Second, it maps climate-justice principles onto the SDGs as an implementation architecture rather than a descriptive checklist. Third, it develops a framework that includes ecological integrity and animal interests alongside distributive, procedural, recognition and intergenerational justice. The central thesis is that climate justice should function as an organizing principle for the interpretation, design and evaluation of climate-resilient development.

For Natural Resources for Human Health, the central relevance of climate justice lies in the dependence of health on natural-resource systems. Climate-sensitive changes in water quantity and quality, crop productivity, fisheries, forest resources, biodiversity, heat regulation and disease ecology can alter nutrition, exposure to pathogens, livelihood security and access to medicinal and culturally important biological resources. The justice question is therefore not only how climate burdens are distributed among people, but whether the natural systems that sustain health are conserved, restored and governed fairly. Accordingly, this review asks how environmental philosophy, international law and the SDGs can be integrated into a framework that protects both human health and the natural-resource base on which health depends. It focuses on the interfaces among climate justice, biodiversity, food and water security, ecosystem health, natural-resource governance and just transition.

2. MATERIALS AND METHODS

This study was designed as an interdisciplinary narrative review with a structured documentary search. Sources were selected from four evidence domains: (i) authoritative climate and environmental assessments, particularly reports of the Intergovernmental Panel on Climate Change, (ii) primary international legal materials, including the UNFCCC, Paris Agreement, UNCLOS, Convention on Biological Diversity, UN resolutions and international advisory opinions, (iii) policy documents addressing the SDGs, just transition, environmental health and ecosystem governance, and (iv) peer-reviewed literature on climate justice, environmental philosophy, capabilities, human rights, biodiversity, food systems, water security and natural-resource management.

Search concepts were combined around the terms climate justice, environmental justice, natural resources, human health, biodiversity, ecosystem services, food security, water security, international environmental law, human rights, Sustainable Development Goals, just transition, loss and damage and intergenerational equity. Priority was given to foundational theoretical works, authoritative institutional assessments and recent legal developments that materially affect climate obligations. The synthesis was qualitative: evidence was coded conceptually against responsibility, vulnerability, capability, participation, intergenerational effects and ecological integrity. Because this is a review of public documents and published literature, no human or animal subjects were recruited and no primary experimental dataset was generated. The review is integrative rather

than systematic and does not claim exhaustive database coverage. Its purpose is theory building and cross-disciplinary synthesis. The analytical framework was used to identify points of convergence and tension between ethical principles, legal obligations and SDG implementation, with particular attention to health-supporting natural resources.

3. RESULTS AND DISCUSSION

3.1 Conceptual evolution and philosophical foundations

Climate justice developed from environmental-justice movements that challenged the unequal distribution of pollution, hazardous facilities and environmental decision-making power. Its scope expanded to global climate burdens, historical emissions, adaptation, loss and damage, energy access, development space and rights of future generations. The concept now operates between states, within states, between social groups, across generations and between humans and the more-than-human world. Three distinctions are important. First, equality is not the same as equity. Equal per-state obligations can reproduce injustice when historical responsibility, population, development needs and capacity differ sharply. Second, vulnerability is not merely natural, it is produced by poverty, discrimination, insecure tenure, weak services and political exclusion. Third, climate justice concerns outcomes and processes. A low-carbon project can reduce emissions while remaining unjust if communities are displaced without meaningful consent, benefits are captured by elites, or ecological costs are externalized.

Climate justice should also be distinguished from climate charity. Assistance based solely on benevolence can be withdrawn or made conditional, justice asks whether duties arise from responsibility, capability, rights, reciprocity or shared institutions. This shift matters for climate finance, technology transfer, adaptation and loss-and-damage arrangements, turning affected persons and states from passive beneficiaries into rights-holders or claimants. Environmental philosophy clarifies why climate harms are morally significant and how competing claims should be weighed. A purely utilitarian approach may prioritize aggregate welfare gains but can obscure who bears costs and whether severe losses to minorities are acceptable. Rights-based approaches protect minimum entitlements, yet require judgments about the content and holders of environmental rights. Egalitarian theories emphasize fair distributions, capabilities approaches focus on what beings are actually able to do and to be, and ecocentric traditions challenge the assumption that only human preferences have intrinsic value.

Distributive justice is central because the remaining carbon budget, costs of decarbonization, adaptation resources and climate damages are scarce and unevenly distributed. Rawlsian reasoning emphasizes fair institutions and priority to the least advantaged. Sen's capability approach shifts attention from resource shares to substantive freedoms, making it useful for adaptation: two communities receiving the same allocation may have radically different capacities to convert resources into safety, health, mobility and livelihood security. Recognition justice asks whether institutions respect identities, histories, knowledge systems and social status. Misrecognition can precede maldistribution. Indigenous peoples, pastoralists, fishing communities and forest-dependent peoples may be harmed when climate projects treat land only as a carbon asset and disregard cultural, spiritual and livelihood relationships. Procedural justice complements recognition through access to information, meaningful participation, reason-giving, transparency and remedies.

Intergenerational justice is unavoidable because greenhouse gases persist, infrastructure locks in emissions, biodiversity loss can be irreversible and adaptation choices shape future opportunity. Gardiner's 'perfect moral storm' captures global dispersion, intergenerational delay and theoretical uncertainty. Intergenerational equity therefore supports precaution, long-term institutional design and avoidance of irreversible ecological thresholds. A more-than-human conception extends justice beyond future humans. Leopold's land ethic, deep ecology, ecofeminist approaches and animal ethics differ substantially but resist treating nature as a mere storehouse of resources. Nussbaum's capabilities approach to animals offers one route: justice should consider species-appropriate opportunities for flourishing. Applied to climate policy, this means mitigation and adaptation should be assessed for habitat connectivity, mortality risks, reproductive disruption, water access and cumulative ecological effects. The strongest philosophical foundation for future climate justice is plural. Distribution identifies who receives benefits and burdens, recognition identifies whose identities and relationships are respected, procedure identifies who participates, capabilities identify whether resources become real opportunities, intergenerational ethics extends the temporal horizon, and ecological justice prevents human development from being pursued through systematic degradation of the living world.

3.2 International climate law, equity and human rights

The UNFCCC established principles that continue to structure climate justice, including equity and common but differentiated responsibilities and respective capabilities (CBDR-RC). The principle does not eliminate universal responsibility, it differentiates expectations in light of national circumstances, historical contribution and capability. The Paris Agreement retains differentiation while creating a universal architecture of nationally determined contributions (NDCs), progression, transparency, adaptation, finance and periodic global stocktakes.

The Paris Agreement brings human-rights and justice-related considerations into its preambular framing. It recognizes that climate action should respect, promote and consider human rights, health, Indigenous peoples, local communities, migrants, children, persons with disabilities, people in vulnerable situations, development, gender equality, empowerment of women and intergenerational equity. It also refers to climate justice as a concept of importance to some. Although preambular language is not a self-contained substantive obligation, it informs interpretation and connects climate governance to broader international law.

The Paris model creates a justice tension. NDCs are nationally determined, allowing political feasibility and differentiated pathways, but aggregate ambition depends on domestic choices. Justice questions therefore arise internationally in determining fair contributions and support, and domestically in deciding who bears transition costs. An ambitious NDC can still be unjust if implemented through regressive pricing, forced displacement, poorly governed carbon markets or biodiversity-damaging land conversion.

Adaptation and loss and damage reveal sharp distributional asymmetries. Justice requires attention not only to funding volumes but accessibility, grant versus debt composition, locally led decision-making, non-economic losses, cultural heritage, displacement and ecosystem loss. The ethical distinction between assistance and responsibility remains contested, but the institutional direction increasingly recognizes that unavoidable climate harms require dedicated arrangements.

Human-rights law strengthens climate justice by translating generalized environmental concern into claims concerning life, health, food, water, housing, culture, equality, participation and remedy. The UN General Assembly's 2022 recognition of the human right to a clean, healthy and sustainable environment reinforced expanding national and regional practice. The right has substantive dimensions—clean air, safe climate, healthy ecosystems and non-toxic environments—and procedural dimensions such as information, participation and access to justice.

A rights-based approach changes policy evaluation in three ways. It imposes floors so some harms cannot be justified solely by aggregate economic benefits, it requires non-discrimination and attention to intersecting vulnerability, and it creates procedural duties that can improve legitimacy and quality of decisions. Climate justice thus connects to administrative law, environmental impact assessment, courts and public accountability.

Human rights also illuminate just transition. Decarbonization can disrupt employment, energy prices and regional economies. A rights-consistent transition requires social dialogue, decent work, retraining, social protection and affordable access to essential energy services. The goal is not to preserve every carbon-intensive activity indefinitely, but to prevent workers and communities from being treated as disposable inputs in technological transition.

3.3 International judicial developments

In May 2024, the International Tribunal for the Law of the Sea concluded that anthropogenic greenhouse-gas emissions can constitute pollution of the marine environment under UNCLOS and interpreted states parties' duties to prevent, reduce and control such pollution through a stringent due-diligence lens. The opinion linked necessary measures to best available science and relevant international rules and standards, including the climate treaty regime, and emphasized cooperation and assistance to developing states. For climate justice, the significance is substantial: climate obligations are not confined to the UNFCCC and Paris Agreement but interact with legal regimes protecting common environmental systems.

The International Court of Justice's advisory opinion of 23 July 2025 further consolidated this trend. The Court treated climate treaties, customary international law, other environmental treaties, the law of the sea and international human-rights law as relevant. It affirmed the customary duty to prevent significant environmental harm in relation to the climate system and due

diligence as the standard for assessing compliance. The Court also rejected the proposition that climate treaties necessarily displace other primary rules through *lex specialis*. This integrated approach resists fragmentation: climate conduct may be evaluated through climate, environmental, marine and human-rights obligations.

The ICJ opinion also strengthens the relationship between sustainable development and climate obligations. Sustainable development does not erase environmental limits, it operates as an interpretive principle requiring integration of environmental protection and development. CBDR-RC remains relevant to equitable burden-sharing, while due diligence requires each state to act in light of circumstances and capabilities. The resulting legal picture is neither strict uniformity nor unlimited discretion.

Advisory opinions are not identical to binding judgments between contentious parties, and implementation depends on states and domestic systems. Nevertheless, authoritative interpretations can influence negotiations, courts, legislation, corporate due diligence, climate finance and evidentiary standards. They represent an important bridge between ethical claims of climate justice and legal accountability.

3.4 Sustainable Development Goals as an implementation framework

The SDGs provide an institutional vocabulary through which climate justice can be operationalized. SDG 13 is the explicit climate goal, but climate justice is inherently cross-goal. Poverty (SDG 1), hunger and sustainable agriculture (2), health (3), gender equality (5), water (6), clean energy (7), inequality (10), sustainable cities (11), responsible consumption and production (12), oceans (14), terrestrial ecosystems (15), justice and institutions (16), and partnerships and finance (17) all shape the distribution and governance of climate risks.

The key analytical move is to treat SDG interactions as justice relationships. Renewable energy advances SDGs 7 and 13, but can conflict with SDGs 15 and 16 if projects fragment habitats or exclude communities. Climate-smart agriculture may support SDGs 2 and 13, but should be evaluated for animal welfare, water demand, tenure and smallholder access. Urban resilience can advance SDGs 11 and 13, yet adaptation investments may trigger climate gentrification. Justice analysis identifies who captures synergies and who bears trade-offs.

The 'leave no one behind' principle bridges the SDGs and climate justice. It requires disaggregated monitoring rather than national averages. A country may improve aggregate resilience while leaving informal settlements, remote rural communities, women-headed households, Indigenous peoples or persons with disabilities exposed. National biodiversity indicators can likewise conceal local habitat fragmentation and species-specific decline.

From a human-health perspective, the SDG linkages are especially direct. SDG 2 connects climate-resilient agriculture and nutrition, SDG 3 captures heat, infectious disease, air-quality and nutrition consequences, SDG 6 concerns safe water and sanitation, SDGs 14 and 15 protect marine and terrestrial systems that support food, livelihoods and biological resources, and SDG 17 addresses finance, technology and capacity. Justice-sensitive implementation therefore requires simultaneous tracking of environmental condition and health distribution.

3.5 Biodiversity, ecosystems and more-than-human justice

A future-facing climate-justice framework must address the moral and ecological status of animals. Climate change affects animals directly through heat stress, extreme events, changing disease vectors, altered phenology and physiological stress, and indirectly through habitat degradation, food scarcity, water scarcity and human responses such as fencing, relocation, intensified production or emergency culling. Marine species face warming, deoxygenation and acidification, terrestrial species confront shifting climatic envelopes and fragmented migration pathways.

Animal vulnerability is not captured adequately by a framework focused solely on human welfare. Species may disappear even where ecosystem services to humans are partly substitutable. Individual animals may suffer even where population-level conservation targets are met. Climate justice should therefore combine conservation ethics, focused on populations and ecosystems, with animal-welfare ethics, focused on sentient individuals. The perspectives can conflict, and governance should make such conflicts explicit.

The One Health perspective provides a bridge. Human, animal and ecosystem health are interdependent, especially where climate change alters vector-borne disease, zoonotic spillover risk, food systems and water quality. Habitat protection can

conserve biodiversity, reduce disease risks, support livelihoods and strengthen adaptation. A justice-oriented One Health approach, however, should recognize reciprocal dependence and intrinsic ecological value rather than valuing animal and ecosystem health only instrumentally.

Mitigation pathways require ecological scrutiny. Large-scale bioenergy, poorly sited wind and solar facilities, hydropower, mining for transition minerals, monoculture afforestation and poorly governed offsets can damage habitats or animal populations. The appropriate question is how deployment can follow mitigation hierarchies: avoid sensitive areas, minimize unavoidable impacts, restore degraded systems and compensate residual harms only where ecological equivalence is credible.

Adaptation should include ecological connectivity, refugia, scientifically justified assisted conservation, water provisioning during extreme events, fire management, coastal ecosystem restoration and climate-informed protected-area design. Because species ranges cross borders, transboundary cooperation becomes a justice issue: states controlling present habitats may bear stewardship responsibilities for species whose future ranges shift across jurisdictions.

Natural resources should be understood here as living and non-living systems that generate direct and indirect health benefits. Forests, wetlands, soils, coastal ecosystems and biodiversity contribute to water purification, food provision, climate regulation, cultural well-being and reservoirs of biologically active compounds. Climate-driven degradation can therefore create health losses even before conventional clinical endpoints are measured. Protecting ecological integrity is consequently both an environmental and preventive-health strategy.

3.6 Indigenous peoples, local communities and epistemic justice

Climate governance is also a contest over knowledge. Scientific modelling is indispensable, but local and Indigenous knowledge can reveal ecological change, seasonal patterns, species behaviour and culturally significant losses that standardized datasets overlook. Epistemic justice requires institutions to treat such knowledge as more than anecdotal consultation while respecting community control, intellectual property and the right not to disclose sacred or sensitive information.

Recognition is especially important because conservation and carbon projects have sometimes reproduced exclusionary models through restrictions on customary access and displacement. Rights-based conservation instead links ecological outcomes with tenure, free, prior and informed consent where applicable, benefit sharing and co-governance. Such approaches can align mitigation, biodiversity protection and social justice.

Locally led adaptation follows similar logic. Communities closest to risks often understand practical constraints and social networks that determine whether infrastructure, early-warning systems or livelihood programs work. Decentralization alone does not guarantee justice, local elites can reproduce exclusion. Effective participation requires representation safeguards, transparent budgets, grievance mechanisms and accessible information.

3.7 Climate finance, loss and damage and just transition

Finance is the operational test of climate justice. Normative commitments have limited effect if vulnerable states and communities cannot access affordable resources for mitigation, adaptation and recovery. Justice-sensitive finance should be assessed by adequacy, predictability, accessibility, additionality, grant equivalence, distribution and decision-making power. Debt-creating finance can deepen vulnerability where countries already face fiscal constraints, while complex accreditation can exclude smaller institutions and local actors.

Loss and damage raises questions that conventional cost-benefit analysis handles poorly. Some losses are non-economic: sacred sites, language tied to place, ancestral graves, biodiversity, identity and community cohesion. Monetary valuation may support compensation but cannot fully restore these goods. Climate-justice mechanisms therefore require plural remedies, including relocation with dignity, cultural continuity measures, ecosystem restoration and participation in recovery decisions.

Just transition connects international equity to domestic political economy. Workers in fossil-fuel regions, low-income energy consumers, transport-dependent households and communities hosting new infrastructure experience transition differently. Policy packages should combine emissions reduction with labour protections, regional diversification, social protection, affordable energy, public transport and participatory planning.

Internationally, a just transition requires attention to supply chains. Clean technologies rely on minerals, manufacturing and land. If decarbonization in high-income markets depends on unsafe labour, water depletion, habitat destruction or uncompensated extraction elsewhere, environmental injustice is displaced geographically. Supply-chain due diligence, circular economy, recycling, material efficiency and benefit-sharing are therefore climate-justice instruments.

3.8 Corporate responsibility, markets and accountability

Corporations shape emissions, land use, finance, technology and political influence. Climate justice requires accountability beyond voluntary net-zero claims. Key elements include credible transition plans, emissions disclosure, avoidance of misleading environmental claims, human-rights and environmental due diligence, transparent lobbying and remedies for affected communities.

Carbon markets can mobilize finance but create justice risks if additionality is weak, baselines are inflated, permanence is uncertain or local rights are ignored. Tonne-based accounting can obscure non-carbon values such as biodiversity, cultural landscapes and animal habitats. High-integrity markets therefore require conservative accounting, safeguards, transparent registries, benefit-sharing and grievance mechanisms.

Litigation and administrative review increasingly function as accountability mechanisms. Courts can test whether governments follow statutory duties, consider scientific evidence, protect rights and provide reasons. Yet litigation is unevenly accessible. Climate justice therefore also requires non-judicial grievance mechanisms, ombuds institutions, environmental defenders' protection and legal aid.

3.9 Food systems, livestock and health-supporting natural resources

Food systems sit at the intersection of climate mitigation, adaptation, animal welfare, rural livelihoods and food security. Agricultural transitions therefore illustrate why climate justice cannot be reduced to a single emissions indicator. Livestock systems contribute to greenhouse-gas emissions and can place pressure on land, water and biodiversity, yet they also support nutrition, income, cultural identity and livelihood security for millions of pastoralists and smallholders. A justice-centred transition should distinguish highly resource-intensive production from low-input and livelihood-dependent systems rather than applying uniform prescriptions across radically different social and ecological contexts.

Demand-side measures can reduce environmental pressure, but their fairness depends on nutrition, affordability, culture and availability of alternatives. Policies encouraging dietary shifts may generate public-health and climate benefits in settings with high consumption of emission-intensive products, while the same policy framing can be inappropriate where animal-source foods address micronutrient deficiencies or where pastoral livelihoods have few substitutes. Capabilities analysis is useful here: justice asks whether households possess real access to nutritious, culturally acceptable and affordable food, not merely whether a theoretical low-carbon option exists.

Animal welfare introduces a further dimension. Heat stress can reduce fertility, growth, milk production and immune function, while drought and flood can affect feed, water, shelter and disease exposure. Climate adaptation in livestock systems should therefore include shade, ventilation, water reliability, breed and species suitability, veterinary surveillance, emergency planning and husbandry practices designed around changing climatic conditions. These measures should not be viewed solely as productivity investments, where animals are sentient, avoidance of preventable suffering is independently relevant to a more-than-human account of justice.

Mitigation policies affecting livestock should also be evaluated for leakage and unintended ecological consequences. Intensification can lower emissions per unit of output in some contexts but may increase absolute production, concentrate waste, heighten disease risks or worsen welfare if stocking densities and management are poor. Extensive systems may support habitat mosaics in some landscapes but contribute to degradation in others. There is therefore no universally just production model. Context-specific assessment should integrate lifecycle emissions, land condition, biodiversity, water, welfare, labour and livelihood outcomes.

The SDG framework helps structure these trade-offs. SDG 2 requires food security and sustainable agriculture, SDG 3 concerns health, SDG 6 water, SDG 8 decent work, SDG 12 responsible production and consumption, SDG 13 climate action, and SDG

15 terrestrial ecosystems. A climate-justice approach treats these goals as co-determinants rather than allowing one target to erase the others. Policies should be evaluated against a minimum safeguard principle: climate benefits should not be purchased through avoidable hunger, livelihood dispossession, severe animal suffering or ecosystem degradation.

The natural-products dimension is also relevant. Climatic shifts, habitat loss and overexploitation can alter the abundance, chemistry and accessibility of medicinal plants, algae, microbes and other biological resources. Conservation of genetic and species diversity protects future options for pharmacological discovery, traditional medicine and nutrition. Access and benefit-sharing principles are important to ensure that commercialization of biological resources does not detach health innovation from the communities and ecosystems that sustain those resources.

3.10 Measuring climate justice and natural-resource health

The movement from principle to implementation requires indicators capable of detecting distributional and ecological effects. Conventional climate metrics such as tonnes of carbon dioxide equivalent remain essential, but they cannot reveal who benefits, who pays, whether participation was meaningful or whether habitats were damaged. A climate-justice dashboard should therefore combine emissions indicators with social, procedural, financial and ecological measures. The purpose is not to collapse justice into a single score, but to make multiple dimensions visible and auditable.

Distributional indicators can include household energy burden, climate-disaster losses by income group, adaptation spending per exposed population, access to cooling, insurance coverage, livelihood disruption and the share of climate finance reaching vulnerable communities. Procedural indicators can measure the timing and inclusiveness of consultation, accessibility of environmental information, representation of affected groups, number and resolution of grievances, and availability of legal or administrative review. Recognition indicators can examine land tenure, cultural-impact assessment, Indigenous participation and protection of customary resource use.

Ecological indicators should include habitat condition, fragmentation and connectivity, species abundance and climate vulnerability, mortality associated with infrastructure, water availability, restoration performance, and cumulative impacts across landscapes or seascapes. Animal-welfare indicators may include heat-stress exposure, access to water and shelter, morbidity, mortality and emergency-response capacity in managed animal populations. These indicators are especially important because a project can report strong carbon performance while imposing localized ecological harm that is invisible in greenhouse-gas accounting.

Indicators also require distributional baselines. A percentage improvement can be misleading when the starting position is deeply unequal. Monitoring should therefore identify who was most exposed before intervention and whether the gap narrows afterward. Similarly, ecological restoration should be compared not only with the immediately degraded baseline but, where scientifically feasible, with reference conditions and long-term functional goals. Otherwise, gradual degradation can become normalized through shifting baselines.

Independent verification and public reporting strengthen accountability. Climate-justice monitoring should publish methods, assumptions and uncertainty, enable community-based monitoring, and provide mechanisms for revising projects when adverse effects emerge. Adaptive management is particularly important under climate uncertainty. A project that appeared reasonable under earlier rainfall, temperature or species-distribution assumptions may become maladaptive as conditions change. Justice therefore requires not only a fair initial decision but an institutional capacity to learn, correct and remedy.

3.11 Climate justice-SDG-natural resource integration matrix

Table 1. Climate justice-SDG-natural resource integration matrix linking justice principles to environmental determinants of human health.

Justice dimension	Relevant SDGs	Natural-resource pathway	Human-health implication	Priority response
Distributive	1, 2, 3, 6, 10, 13	Unequal access to water, food, land, cooling and	Malnutrition, heat risk, unsafe water and	Progressive finance, universal basic services,

		adaptation finance	livelihood-related health stress	targeted adaptation
Procedural	10, 13, 16	Participation in land, water, conservation and energy decisions	Better fit of interventions and reduced exclusion	Early consultation, information access and grievance mechanisms
Recognition	5, 10, 15, 16	Respect for Indigenous/local knowledge and resource relationships	Protection of culturally important foods, medicines and livelihoods	Tenure security, co-governance and benefit sharing
Intergenerational	12, 13, 14, 15	Avoiding irreversible depletion and ecosystem loss	Preserves future determinants of health and biological resources	Precaution, restoration and long-term targets
Ecological	3, 6, 13, 14, 15	Biodiversity, soil, freshwater, forests and marine systems	Supports nutrition, water quality, disease regulation and well-being	Ecosystem restoration, connectivity and cumulative-impact assessment
Corrective	13, 16, 17	Remedy for climate-related resource loss and degradation	Recovery of health, livelihoods and essential services	Loss-and-damage finance, rehabilitation and ecosystem restoration

3.12 Integrated governance model

The proposed model has five pillars. Pillar I—Equitable Burden Sharing—uses responsibility, capability and development need to assess mitigation, finance and technology obligations. Pillar II—Rights, Recognition and Participation—requires non-discrimination, meaningful participation, Indigenous and local rights, gender responsiveness, information and remedy. Pillar III—Intergenerational Stewardship—tests policies for long-term lock-in, irreversible harm and preservation of future capabilities. Pillar IV—Ecological and Animal Justice—requires biodiversity safeguards, habitat connectivity, animal-welfare consideration and ecosystem restoration. Pillar V—Implementation and Accountability—links targets to finance, indicators, institutional responsibility, independent review and corrective mechanisms.

The model is multi-level. Internationally, it informs equitable climate finance, treaty interpretation and cooperation. Nationally, it can guide NDCs, adaptation plans, budgets, energy policy and biodiversity strategies. Subnationally, it can shape land-use planning, heat action plans, coastal management and disaster risk reduction. At project level, it can improve environmental and social impact assessment. At each level, the same questions apply: Who benefits? Who bears risk? Who decides? What happens to future generations? What happens to ecosystems and animals? What remedy exists if safeguards fail?

A practical climate-justice assessment should precede major climate measures. It should identify affected groups and species, distributional impacts, cumulative ecological effects, alternatives, participation processes, financing implications, transition support and monitoring indicators. Assessment should continue after approval because climate conditions, technologies and social impacts change over time.

Integrated Architecture of Future Climate Justice

First, governments should embed climate-justice assessments into NDCs, national adaptation plans, long-term strategies and major climate-related infrastructure decisions. These assessments should include distributional, human-rights, intergenerational, biodiversity and animal-welfare dimensions rather than relying only on carbon metrics.

Second, climate finance institutions should simplify access for vulnerable countries and locally led organizations, increase grant-based adaptation and loss-and-damage support where debt sustainability is a concern, and publish disaggregated information on ultimate beneficiaries. Funding criteria should reward verified social and ecological co-benefits.

Third, states should strengthen procedural environmental rights through timely information, participatory planning, reasoned decisions, environmental defenders' protection and effective remedies. Participation should occur early enough to change project design.

Fourth, biodiversity and animal-welfare safeguards should be mainstreamed into mitigation and adaptation. Renewable-energy zoning, transmission corridors, afforestation, carbon removal and adaptation infrastructure should use strategic assessment, cumulative-impact analysis and mitigation hierarchies.

Fifth, SDG reporting should incorporate justice-sensitive indicators. National averages should be complemented by distributional data and ecological indicators such as habitat condition, connectivity and species vulnerability.

Sixth, legal and policy institutions should respond to the integrated character of climate obligations reflected in recent international jurisprudence. Climate ministries, environment ministries, human-rights bodies, marine authorities and development agencies should coordinate rather than operate in silos.

Seventh, just-transition policy should be anticipatory. Governments should identify regions and occupations exposed to structural change before closures occur, invest in skills and diversification, and protect affordable access to energy and mobility. International cooperation should prevent transition-mineral costs from being displaced to weaker jurisdictions.

Finally, research agendas should deepen the more-than-human dimension of climate justice, including animal welfare under extreme heat, climate-driven migration barriers, ethical assisted migration, conservation triage, renewable-energy wildlife interactions and methods for representing non-human interests.

The integration developed here reveals substantial convergence among environmental philosophy, international law and sustainable development. Philosophical theories supply reasons for differentiated responsibility, participation, intergenerational restraint and ecological stewardship. International law increasingly translates these ideas into duties of prevention, due diligence, cooperation, rights protection and science-informed action. The SDGs provide an implementation map linking climate policy to poverty, health, energy, inequality, institutions and ecosystems. None of these domains is sufficient alone.

Unresolved tensions remain. Climate urgency can encourage centralized decision-making, while procedural justice requires participation. Rapid renewable deployment can reduce climate risk while creating local biodiversity impacts. Economic development can strengthen adaptive capacity while increasing emissions and material throughput. Compensation can address some losses but not irreversible ecological or cultural destruction. Justice therefore cannot be reduced to a single metric.

A plural framework is more demanding but more realistic. Climate policy already makes implicit choices about whose interests matter and what trade-offs are acceptable. Making justice criteria explicit improves transparency and allows disagreement to be structured. It also reduces the risk that decarbonization reproduces extractive patterns that contributed to the climate crisis.

The more-than-human dimension is the most significant extension proposed here. Human rights remain indispensable, but a stable climate and healthy biosphere are not only instruments for human welfare. Animals experience climate harms directly, species have evolutionary and ecological significance, and ecosystems possess relational and intrinsic values recognized across ethical and cultural traditions. Incorporating these interests does not require treating all beings identically, it requires processes that do not render non-human losses invisible.

The recent international advisory opinions strengthen this direction. ITLOS and the ICJ demonstrate that climate change cannot be legally isolated from marine protection, customary environmental law, human rights and sustainable development. Due-diligence reasoning focuses on the quality of state conduct: use of best available science, adequate regulation, cooperation, monitoring and proportionate action in light of risk. Justice helps inform what adequate conduct means in differentiated circumstances.

For NRFHH-oriented research and policy, the model can be applied as a screening framework before interventions affecting forests, agricultural systems, freshwater, coasts, biodiversity or natural-product resources. Each intervention should be evaluated for climate effectiveness, distribution of benefits and burdens, effects on ecosystem condition, consequences for health determinants, participation of affected communities and availability of remedy.

4. LIMITATIONS AND FUTURE RESEARCH

This article is conceptual and doctrinal. It does not estimate a numerical fair-share emissions allocation, measure causal effects of particular policies, or provide country-specific legal advice. International legal developments continue to evolve, and implementation of advisory opinions will vary. The SDG framework itself contains tensions and indicators that do not always capture distributional or ecological quality.

Future research should test the proposed framework across renewable energy, livestock systems, coastal adaptation, forest carbon, urban heat and transition-mineral extraction. Comparative legal research could examine how domestic courts translate international obligations into standards of review. Ecological research should develop indicators connecting climate policy with animal welfare and habitat connectivity.

Future studies should quantify links between climate-justice interventions and measurable human-health outcomes, including nutrition, water-borne disease, heat exposure, mental well-being and access to medicinal biological resources. Systematic reviews and meta-analyses are needed where evidence is sufficiently mature. Natural-product and biodiversity research should also investigate how climatic stress changes the distribution, yield and bioactive profiles of medicinal species, while ensuring conservation and equitable benefit sharing.

5. CONCLUSIONS

The future of climate justice lies in integration. Climate change cannot be governed adequately as a narrow problem of atmospheric carbon, just as justice cannot be reduced to compensation after harm. A durable framework must connect fair burden sharing, human rights, recognition, participation, intergenerational responsibility, ecological integrity and institutional accountability.

Environmental philosophy provides the normative vocabulary for asking what is owed and to whom. International law increasingly supplies duties of prevention, due diligence, cooperation and rights protection, reinforced by major international advisory opinions in 2024 and 2025. The SDGs provide a practical architecture for connecting climate action to poverty reduction, health, energy, inequality, sustainable production, oceans, terrestrial ecosystems, institutions and global partnership.

For animal and environmental scholarship, the crucial next step is to expand the community of justice. Climate policy must protect vulnerable people, but it must also recognize animals, species and ecosystems whose futures are being reshaped by human decisions. A transition that lowers emissions while sacrificing communities, habitats or animal welfare cannot be considered fully just. The objective should be a low-emission future in which human dignity, ecological resilience and more-than-human flourishing are mutually reinforcing conditions of sustainable development

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