

ENVIRONMENTAL LAW AND SUSTAINABLE GOVERNANCE

Comparative Perspectives from
Brazil and Morocco



Farabi Yayınevi

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PREFACE

Environmental law has become one of the most significant fields of contemporary legal scholarship, as environmental degradation, climate change, biodiversity loss, and the governance of natural resources increasingly shape national and international legal agendas. The protection of the environment is no longer limited to technical regulation; it is closely connected with constitutional duties, human rights, public participation, transparency, sustainable development, and state responsibility.

This edited volume, entitled *Environmental Law and Sustainable Governance: Comparative Perspectives from Brazil and Morocco*, brings together scholarly contributions that examine environmental protection through different legal, institutional, and comparative perspectives. The chapters included in this book address the role of constitutional courts in environmental transparency, the legal architecture of Morocco's environmental protection strategy, and the emerging human rights dimensions of climate change and state responsibility under the law of the sea.

The first chapter focuses on environmental transparency as a constitutional remedy in the Brazilian Federal Supreme Court's judgment concerning Amazon rainforest protection. It highlights the importance of reports, open data, public indicators, and social oversight in strengthening environmental accountability. The second chapter examines Morocco's environmental protection strategy and its relationship with sustainable development, emphasizing the gap between legislative ambition and practical implementation. The third chapter explores climate change and state responsibility under the law of the sea, drawing attention to the growing human rights implications of environmental harm and climate-related risks.

Together, these chapters demonstrate that sustainable environmental governance requires more than the adoption of legal norms. It also requires effective implementation, institutional coordination, transparency, public participation, and accountability. By presenting comparative perspectives from Brazil and Morocco, as well as broader international legal debates, this volume aims to contribute to the academic discussion on environmental law and sustainable governance.

We hope that this book will be a valuable resource for researchers, legal scholars, policymakers, students, and all readers interested in environmental protection, sustainability, and the evolving role of law in addressing global ecological challenges.

July 16, 2026
Türkiye

CHAPTER 1

**ENVIRONMENTAL TRANSPARENCY AS A
CONSTITUTIONAL REMEDY IN THE BRAZILIAN
FEDERAL SUPREME COURT'S JUDGMENT:
REPORTS, OPEN DATA, AND SOCIAL OVERSIGHT
IN ADO No. 54-FD AND ADPF No. 760-FD**

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INTRODUCTION

The protection of the Amazon rainforest has become one of the most significant constitutional, environmental, and institutional challenges in contemporary Brazil. The Amazon rainforest is not only a strategic ecological system for the maintenance of biodiversity, climate stability, and the protection of Indigenous peoples and traditional communities, but also a constitutional space in which the duties of the State, the limits of administrative discretion, and the effectiveness of fundamental rights are constantly tested. The increase in illegal deforestation, the weakening of environmental enforcement structures, the insufficiency of budgetary execution, and the discontinuity or partial implementation of public policies aimed at preserving the Legal Amazon rainforest have intensified the debate on the role of constitutional courts in the protection of environmental rights. Consequently, the joint judgment of Direct Action of Unconstitutionality by Omission No. 54-Federal District (ADO no. 54-FD) and Allegation of Breach of Fundamental Precept No. 760-Federal District (ADPF no. 760-FD) by the Brazilian Federal Supreme Court represents an important landmark in environmental constitutional adjudication. The leading case did not involve only an isolated act of environmental degradation, but rather a broader pattern of alleged state omission and institutional insufficiency in the implementation of policies designed to prevent and control deforestation in the Amazon rainforest. The controversy required the Federal Supreme Court to examine whether the State had fulfilled its constitutional duties under the right to an ecologically balanced environment and whether the insufficiency of public action could justify judicial intervention in the field of environmental public policies. The judgment is especially relevant because the Brazilian Federal Supreme Court recognized that environmental protection cannot depend exclusively on abstract constitutional declarations or general administrative commitments. The effectiveness of the right to an ecologically balanced environment requires concrete measures, institutional coordination, public planning, monitoring mechanisms, and the continuous evaluation of results. In this manner, the case demonstrates that environmental constitutionalism is not limited to the recognition of ecological values, but also involves the development of legal and institutional mechanisms capable of transforming constitutional duties into verifiable public policies.

The litigation surrounding ADO no. 54-FD and ADPF no.760-FD also reveals the complexity of judicial review in matters involving structural environmental problems. Illegal deforestation in the Amazon rainforest is not the result of a single administrative failure, but of cumulative and interconnected factors, including deficiencies in inspection, lack of institutional capacity, budgetary restrictions, normative weakening, discontinuity of public programs, and insufficient transparency regarding governmental goals and outcomes. These elements create a constitutional problem that cannot be adequately addressed through a simple declaratory judgment. For this reason, the Federal Supreme Court's response had to consider not only the existence of environmental harm, but also the institutional conditions necessary to ensure the future effectiveness of environmental protection.

One of the most relevant aspects of the joint judgment is the central role attributed to environmental transparency. The Brazilian Federal Supreme Court identified the lack of sufficient information on the implementation of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon as one of the relevant dimensions of the controversy. This aspect is particularly important because the absence of clear, objective, accessible, and updated information prevents society from evaluating whether the State is effectively complying with its constitutional duties. Without public data, indicators, reports, and accessible information, environmental policy becomes opaque, resistant to scrutiny, and vulnerable to discontinuity.

Environmental transparency, therefore, assumes a function that goes beyond the ordinary administrative duty of publicity. In the context of ADO no. 54-FD and ADPF no. 760-FD, transparency becomes a condition for the effectiveness of the constitutional remedy itself. The Federal Supreme Court required the production and publication of reports containing the actions adopted and the results achieved in withstand illegal deforestation. These reports should be objective, transparent, clear, written in accessible language, periodically updated, and, whenever possible, accompanied by maps, graphs, and other visual communication tools. This requirement reveals a sophisticated understanding of access to environmental information: information must not only exist; it must be understandable, publicly available, comparable, and useful for monitoring public action.

This research starts from the assumption that the fundamental right to an ecologically balanced environment has both substantive and procedural dimensions. The substantive dimension requires the State to adopt effective measures to prevent environmental degradation, control illegal deforestation, protect biodiversity, and safeguard the rights of Indigenous peoples, traditional communities, present generations, and future generations. The procedural dimension requires access to information, public participation, institutional accountability, and mechanisms that enable society to monitor the implementation of environmental policies. These two dimensions are interdependent. Environmental protection is weakened when substantive duties are not accompanied by transparency, participation, and public control.

In this regard, the joint judgment of ADO no. 54-FD and ADPF no. 760-FD allows the development of an important theoretical argument: environmental transparency may be understood as a constitutional remedy. This does not mean that transparency alone is sufficient to stop deforestation or replace the need for inspection, sanctions, institutional strengthening, and budgetary resources. Rather, it means that transparency can operate as a structural instrument that makes these measures visible, measurable, and subject to democratic scrutiny. Reports, open data, public indicators, and social oversight create conditions for monitoring compliance with judicial orders and for evaluating whether governmental action is producing concrete results.

The research problem guiding this survey is therefore the following: can the Federal Supreme Court's requirement of clear, objective, accessible, and periodically updated environmental information in the joint judgment of ADO no. 54-FD and ADPF no. 760-FD be understood as an autonomous constitutional instrument for implementing the fundamental right to an ecologically balanced environment? This problem is relevant because it shifts the focus from transparency as a merely instrumental administrative principle to transparency as a structural component of constitutional accountability. It also allows the analysis of how open data, public reports, visual communication, and social oversight may contribute to the enforcement of environmental rights in complex litigation.

The research hypothesis is that, in the joint judgment of ADO no. 54-FD and ADPF no. 760-FD, environmental transparency was treated not merely as an accessory element of public administration, but as a structural constitutional remedy. The hypothesis is based on the understanding that the Federal Supreme Court transformed reports, open data, monitoring indicators, and social oversight into instruments of constitutional accountability. By requiring periodic and accessible information, the Federal Supreme Court sought to connect judicial review, institutional planning, democratic participation, and the effective control of environmental public policies. This approach makes it possible to supervise governmental action without completely replacing the Executive Branch in the formulation and execution of technical environmental measures. The study adopts the hypothetical-deductive method. It begins with the general premise that the protection of environmental rights, especially in cases involving complex public policies and structural omissions, depends not only on substantive state action, but also on procedural guarantees of access to information, participation, and accountability. From this premise, the investigation examines whether the judicial orders issued in ADO no. 54-FD and ADPF no. 760-FD confirm the hypothesis that transparency can function as a constitutional remedy in structural environmental litigation. The methodological procedures include documentary analysis of the joint judgment, qualitative examination of its operative provisions, and theoretical reconstruction of the relationship between environmental constitutionalism, open government, and structural litigation.

The relevance of this approach lies in the fact that environmental degradation often results from institutional fragmentation, discontinuity of public policies, lack of coordination among public bodies, insufficient budgetary allocation, and the absence of reliable information on governmental performance. In such circumstances, constitutional adjudication cannot be limited to declaring rights or recognizing omissions. It must also establish conditions for the monitoring of compliance, the evaluation of results, and the participation of society in the oversight of state action. This is why reports, open data, indicators, and social oversight acquire constitutional relevance: they allow the transformation of environmental duties into measurable commitments.

The joint judgment also raises an important question regarding the separation of powers. Judicial intervention in environmental public policies may be criticized when it appears to replace administrative discretion or impose detailed policy choices on the Executive Branch. However, the Federal Supreme Court's emphasis on transparency, planning, goals, indicators, and periodic reporting suggests a different model of intervention. Instead of directly managing environmental policy, the Federal Supreme Court required the State to justify its action, present plans, disclose information, and make results publicly available. This form of adjudication seeks to preserve the institutional role of the Executive Branch while imposing constitutional standards of rationality, publicity, effectiveness, and accountability. Thus, the concept of environmental transparency as a constitutional remedy is closely related to the idea of democratic monitoring. The effectiveness of environmental protection cannot be assessed only by public authorities themselves. Civil society organizations, scientific institutions, Indigenous peoples, traditional communities, citizens, and oversight bodies must have access to reliable and understandable information in order to evaluate the implementation of environmental policies. The judicial requirement of open and periodic information strengthens the public sphere and reinforces the participatory dimension of environmental constitutionalism.

The preliminary results achieved of this research indicate that the Brazilian Federal Supreme Court broadened the meaning of environmental protection connecting ecological effectiveness to transparency, institutional capacity, public participation, and democratic control. The joint judgment of ADO no. 54-FD and ADPF no. 760-FD demonstrates that the implementation of the fundamental right to an ecologically balanced environment requires more than formal plans, general commitments, or isolated administrative actions. It requires verifiable data, objective goals, measurable indicators, accessible communication, periodic evaluation, and institutional mechanisms that allow society to monitor whether the State is effectively fulfilling its constitutional duties. Therefore, this survey argues that environmental transparency may be understood as a structural remedy in constitutional environmental litigation.

In the Amazon rainforest deforestation leading case, transparency operates as a bridge between constitutional norms and administrative implementation, between judicial review and democratic participation, and between environmental planning and social accountability. By transforming reports, open data, indicators, and social oversight into mechanisms of constitutional monitoring, the Brazilian Federal Supreme Court contributed to the construction of a model of environmental governance in which the effectiveness of rights depends not only on state action, but also on the public visibility and democratic controllability of that action.

1. ENVIRONMENTAL TRANSPARENCY AND THE PROCEDURAL DIMENSION OF THE RIGHT TO AN ECOLOGICALLY BALANCED ENVIRONMENT

The fundamental right to an ecologically balanced environment cannot be understood only as a substantive legal position aimed at preventing ecological degradation, preserving biodiversity, and ensuring the material conditions necessary for human life. It also contains a procedural dimension, since the effectiveness of environmental protection depends on access to information, public participation, institutional accountability, and access to administrative and judicial mechanisms capable of correcting omissions or insufficient state action (Freitas & Brasil, 2018, pp. 245-246; Sarlet & Fensterseifer, 2022, pp. 77-78).

This procedural dimension is particularly relevant because environmental harm often involves scientific uncertainty, cumulative impacts, diffuse interests, and risks that may affect present and future generations. In this context, environmental rights require not only legal prohibitions and public policies, but also institutional mechanisms that allow society to know the environmental situation, evaluate risks, participate in decision-making processes, and monitor public authorities (Machado, 1997, pp. 213-214; Sarlet & Fensterseifer, 2022, p. 78). Machado (1997, p. 213) provides an important foundation for this argument by stating that environmental information must be collected and transmitted throughout the different stages of human activities that use or affect environmental resources.

According to the author, information should not be disclosed only after environmental damage has already occurred; rather, it must circulate in advance so that prevention may be possible.

Machado (1997, p. 214) also distinguishes between the mere search for environmental information and its anticipated or systematic communication. It is not sufficient that individuals or social groups may obtain information if they request it; for environmental information to produce effective results, those who hold such information must make it public in a continuous and organized manner, regardless of any prior request. This argument provides the basis for understanding active environmental transparency as a constitutional requirement.

Environmental transparency must therefore be understood as more than the formal publication of documents. Information must be available, intelligible, updated, reliable, and organized in a way that enables public scrutiny. If environmental data are dispersed, incomplete, excessively technical, or inaccessible to the affected population, the right to information loses much of its democratic function (Machado, 1997, p. 214; Freitas & Brasil, 2018, p. 246).

The connection between information and participation is especially evident in environmental impact assessment and public hearings. Thus, the effectiveness of public participation depends on several concrete conditions, such as prior notice, access to documents, adequate time for debate, impartiality in the conduct of the hearing, answers to the questions presented, and the possibility of submitting documents and arguments (Machado, 1997, p. 214).

For this reason, participation cannot be reduced to a only formal opportunity to speak. Affected communities, civil society organizations, and citizens can only participate meaningfully when they have previous access to the technical studies, environmental reports, risk assessments, and institutional criteria that support the administrative decision. Participation without adequate information tends to become symbolic, while information without participation may become merely bureaucratic (Machado, 1997, p. 214; Bueno & Brasil, 2023, pp. 2-3).

Freitas and Brasil (2018, pp. 245-246) reinforce this argument by analyzing Principle 10 of the Rio Declaration, which connects environmental democracy to access to information, public participation, and access to justice. The authors emphasize that these access rights are essential for deepening environmental democracy and for reducing inequalities in decision-making processes, especially in relation to groups traditionally marginalized from public deliberation.

In this regard, environmental democracy cannot be limited to the abstract recognition of environmental values or to the formal existence of participatory mechanisms. It requires real conditions for informed participation, including the expansion of access to information, the strengthening of public awareness, and the availability of administrative and judicial mechanisms capable of protecting environmental rights and repairing environmental damage (Freitas & Brasil, 2018, pp. 246-249).

Bueno and Brasil (2023, pp. 1-2) develop this reasoning in the context of environmental licensing. They argue that public hearings are important spaces for citizen participation in administrative licensing processes involving projects with significant environmental impact. Such hearings may contribute to a better administrative decision because they allow different social actors to present information, arguments, and perceptions regarding the environmental impacts of the project.

The authors also reject a purely technocratic conception of environmental licensing. Although technical, scientific, and legal assessments are indispensable, the environmental licensing process should not disregard the persons affected by the project or ignore the information brought by society. The contributions presented in public hearings must be considered in the reasoning of the administrative act, otherwise participation becomes merely formal and does not effectively influence the decision-making process (Bueno & Brasil, 2023, pp. 3-4).

This understanding allows one to affirm that environmental transparency also includes transparency in decision-making. Society must be able to know not only the environmental data related to risks and impacts, but also the reasons why public authorities adopted a certain decision, rejected alternatives, or considered a given policy sufficient.

The duty to provide reasons is therefore connected to the democratic function of environmental participation and to the effectiveness of the right to an ecologically balanced environment (Bueno & Brasil, 2023, pp. 3-4; Machado, 1997, p. 214).

Bueno and Brasil (2023, pp. 3-4) further identify practical obstacles that reduce the effectiveness of public participation, such as failures in communication, difficulties in access to information, and low public awareness regarding the possibility of contributing to environmental hearings. These obstacles show that environmental transparency must be designed with attention to social reality, since the mere existence of technical documents or formal notices does not ensure effective participation.

Sarlet and Fensterseifer (2022, pp. 77-78, 85) contribute to this discussion by placing environmental and climate protection within the constitutional framework of fundamental rights and state duties of protection. Their analysis emphasizes the objective dimension of fundamental rights, according to which the State must organize institutions, procedures, and public policies capable of ensuring the effectiveness of constitutional environmental protection.

The objective dimension of fundamental rights is decisive because it prevents environmental rights from being reduced to abstract constitutional values. It imposes on the State the duty to adopt legislation, administrative measures, inspection mechanisms, institutional structures, and public policies aimed at protecting ecological integrity and fundamental rights. In this framework, transparency, participation, and accountability are procedural expressions of the State's duty to protect the environment (Sarlet & Fensterseifer, 2022, p. 85).

The authors also attach environmental and climate protection to intergenerational justice. The protection of the environment, as established in Article 225 of the Brazilian Federal Constitution of 1988, is directed not only to present generations, but also to future generations. This intertemporal dimension reinforces the importance of public information, scientific monitoring, and institutional accountability, since future generations cannot participate directly in current decision-making processes (Sarlet & Fensterseifer, 2022, pp. 78-81).

This theoretical basis is directly connected to the joint judgment of Direct Action of Unconstitutionality by Omission no. 54-FD and Allegation of Breach of Fundamental Precept no. 760-FD. In that judgment, the Brazilian Federal Supreme Court treated access to information, transparency, indicators, reports, and social oversight as relevant mechanisms for monitoring environmental public policies and for assessing the implementation of measures against illegal deforestation in the Amazon (Brazilian Federal Supreme Court, 2024a, pp. 211-212; Brazilian Federal Supreme Court, 2024b, pp. 211-212).

From this dialogue among Machado (1997), Freitas and Brasil (2018), Bueno and Brasil (2023), and Sarlet and Fensterseifer (2022), it is possible to propose that environmental transparency operates as a structural bridge between constitutional normativity, institutional performance, and democratic control. The right to an ecologically balanced environment cannot be fulfilled only through formal policies, technical plans, or abstract declarations of protection. It requires informational structures capable of making state action visible, measurable, contestable, and open to social oversight. Reports, open data, public indicators, visual communication, and reasoned decision-making therefore become instruments through which society can verify whether environmental policies are effectively implemented.

In this manner, transparency strengthens accountability, qualifies participation, reduces institutional opacity, and gives concrete meaning to environmental constitutionalism. The authorial contribution of this research lies precisely in affirming that, in complex environmental disputes, transparency should be treated not merely as an auxiliary mechanism of public administration, but as a constitutional remedy for monitoring, correcting, and democratizing environmental governance.

2. REPORTS, OPEN DATA, AND SOCIAL OVERSIGHT AS STRUCTURAL REMEDIES IN THE JOINT JUDGMENT OF ADO 54-DF AND ADPF 760-DF

The joint judgment of Direct Action of Unconstitutionality by Omission no. 54-DF and Allegation of Breach of Fundamental Precept no. 760-DF by the Brazilian Federal Supreme Court allows environmental transparency to be examined not only as a procedural guarantee, but also as a structural remedy.

The Federal Supreme Court did not only recognize the existence of failures in the governmental policy for the protection of the Amazon rainforest. It required plans, goals, indicators, reports, institutional strengthening, and public information mechanisms capable of making State action visible and subject to permanent monitoring (Brazilian Federal Supreme Court, 2024a, pp. 6-9; Brazilian Federal Supreme Court, 2024b, pp. 7-9). In this regard, the judgment connects environmental constitutionalism with the logic of structural litigation, since the remedy adopted is not exhausted in a single command, but requires continuous implementation, public accountability, and institutional follow-up. The structural character of the judgment is evident in the Federal Supreme Court's recognition that the problem of illegal deforestation in the Amazon rainforest results from a complex set of institutional failures. The controversy involved the reduction of environmental enforcement, the weakening of public bodies, budgetary insufficiency, discontinuity in the implementation of the Action Plan for the Prevention and Control of Deforestation in the Legal Amazon, and lack of transparency regarding goals, actions, and results (Brazilian Federal Supreme Court, 2024a, pp. 2-5; Brazilian Federal Supreme Court, 2024b, pp. 3-6). These elements reveal that environmental degradation in the Amazon rainforest cannot be adequately addressed through isolated or merely declaratory judicial orders. It requires a form of adjudication capable of reorganizing institutional conduct, imposing duties of planning, and creating mechanisms for monitoring compliance.

This approach is consistent with the theory of structural proceedings in environmental matters. Brasil (2021, pp. 153-154) argues that institutional dialogues and structural procedure are adequate means for resolving environmental conflicts because they allow the reorganization of public policies through decisions capable of producing relevant structural change. In the same way, Bambirra and Brasil (2021, pp. 1-3) maintain that structural procedure is an appropriate mechanism for protecting the fundamental right to an ecologically balanced environment, especially when environmental protection requires the restructuring and reorganization of public policies. These contributions are relevant because they demonstrate that environmental litigation often demands remedies that go beyond compensation or prohibition, requiring institutional transformation and continuous supervision.

The structural remedy adopted in the joint judgment also reflects the idea that complex environmental disputes require a broader procedural model than the traditional bipolar structure of litigation. Bambirra and Brasil (2021, p. 3) argue that a proceeding aimed at protecting fundamental rights in a situation of structural nonconformity requires broader participation, expanded judicial cognition, and the possibility for the court to understand the problem from multiple perspectives. This reasoning applies directly to the Amazon rainforest deforestation case. The implementation of the fundamental right to an ecologically balanced environment depends on the coordinated action of several institutions, including environmental agencies, Indigenous protection bodies, security forces, budgetary authorities, and oversight institutions.

The Federal Supreme Court's determination that the Executive Branch present an effective plan for the implementation of the PPCDAm or equivalent policy instruments illustrates this structural logic. The plan was required to include schedules, goals, objectives, deadlines, projected results, monitoring indicators, and information necessary to ensure the effective execution of environmental public policies (Brazilian Federal Supreme Court, 2024a, pp. 6-7; Brazilian Federal Supreme Court, 2024b, pp. 7-8). This remedy does not replace the Executive Branch in the technical formulation of environmental policy. Rather, it establishes constitutional parameters of rationality, transparency, effectiveness, and accountability within which administrative discretion must be exercised.

Reports occupy a central position in this model. The Federal Supreme Court required that the Union and the competent federal bodies produce clear, objective, transparent, and accessible reports containing the actions adopted and the results achieved in compliance with the judicial orders. Such reports should be periodically updated and made available to the public, preferably with maps, graphs, and other visual communication tools (Brazilian Federal Supreme Court, 2024a, pp. 8-9; Brazilian Federal Supreme Court, 2024b, pp. 8-9). In this framework, reports are not merely administrative records. They are instruments of constitutional monitoring because they allow the Federal Supreme Court, civil society, scientific institutions, Indigenous peoples, traditional communities, and citizens to verify whether the State is actually complying with its environmental duties.

Open data also assumes constitutional relevance in the judgment. The Federal Supreme Court required that information on the measures adopted against illegal deforestation be made publicly available in open format and, whenever possible, integrated with the National Environmental Information System (Brazilian Federal Supreme Court, 2024a, p. 9; Brazilian Federal Supreme Court, 2024b, p. 9). This requirement expands the meaning of transparency. It is not enough for the State to produce information internally or to disclose fragmented documents. Information must be structured, reusable, comparable, and accessible to the public. Open data allows independent verification, scientific analysis, social oversight, and institutional accountability.

The use of reports and open data as remedies is compatible with the broader normative framework of access rights in environmental matters. Brasil and Queiroz (2019, pp. 78-79) state that the Escazú Agreement is aimed at ensuring the effective implementation of access to environmental information, public participation in environmental decision-making, and access to justice in environmental matters in Latin America and the Caribbean. They also connect these rights to Principle 10 of the Rio Declaration, according to which environmental issues are best addressed with public participation, access to information held by public authorities, and effective access to judicial and administrative mechanisms (Brasil & Queiroz, 2019, pp. 79-80). From this perspective, the reports and open data required by the Federal Supreme Court operate as concrete procedural instruments for the realization of environmental democracy.

Social oversight is the third element of the structural remedy. The judgment expressly connects transparency and public participation with the right of society to monitor the measures, goals, and results of the environmental policy adopted to combat illegal deforestation (Brazilian Federal Supreme Court, 2024a, pp. 8-9; Brazilian Federal Supreme Court, 2024b, pp. 8-9). Social oversight transforms environmental protection into a shared constitutional responsibility. The State remains responsible for planning and executing public policies, but society is given the informational conditions necessary to evaluate, criticize, and demand compliance with constitutional duties.

This aspect is particularly important in environmental matters because the affected interests are diffuse, collective, intergenerational, and often connected to vulnerable groups. Brasil and Ferreira (2023, pp. 1092-1095) argue that the protection of environmental assets requires mechanisms capable of expanding access to justice and strengthening the legal protection of environmental goods, especially in contexts marked by structural deficits and insufficient institutional responses. Although their study focuses on the attribution of legal personality to environmental assets based on the Atrato River case in Colombia, its theoretical contribution is relevant here because it reinforces the need to rethink procedural mechanisms when traditional forms of standing, representation, and institutional action prove insufficient to protect environmental rights.

The joint judgment also dialogues with the idea of institutional dialogue. Brasil (2021, pp. 153-154) emphasizes that environmental conflicts require dialogue among institutions, especially when the aim is to restructure public policies and produce a relevant transformation in the protection of the fundamental right to an ecologically balanced environment. In the Amazon rainforest deforestation case, the Federal Supreme Court did not assume the direct administration of environmental policy. Instead, it required the Executive Branch to present plans, goals, and reports, while maintaining the possibility of judicial monitoring. This model preserves the institutional role of the administration but subjects it to constitutional standards of transparency, effectiveness, and accountability.

This dialogical dimension is reinforced by the Federal Supreme Court's treatment of structural proceedings. The judgment refers to the idea that the second phase of a structural proceeding is not merely mechanical execution, but a phase in which the means required to reach the projected result must be identified and implemented. The decision also indicates that successful structural implementation requires defining the time, mode, and degree of restructuring, the transition regime, and the form of permanent evaluation and oversight of the structural measures (Brazilian Federal Supreme Court, 2024a, p. 408; Brazilian Federal Supreme Court, 2024b, p. 474). These elements demonstrate that structural remedies are not limited to commands of conduct; they require a procedural architecture of implementation.

The Federal Supreme Court's reference to monitoring by the Center for Complex Structural Proceedings also reinforces the institutional nature of the remedy. The judgment acknowledges that the main challenge in proceedings of this kind is not merely to decide, but to ensure compliance over time (Brazilian Federal Supreme Court, 2024a, p. 408; Brazilian Federal Supreme Court, 2024b, pp. 452, 474). This is why the requirement of reports, indicators, and open information is essential. Without mechanisms of monitoring and evaluation, structural decisions risk becoming symbolic. With such mechanisms, the Court can follow the implementation of the measures while society can exercise democratic oversight. The role of technology is also relevant to this discussion. Brasil (2023, pp. 370-371) argues that electronic procedure and digital tools may improve speed, efficiency, transparency, access to information, and the management of documents in environmental litigation. The author further observes that technologies such as websites, livestreams, message groups, and digital communication tools may broaden participation and facilitate the construction of dialogical judicial decisions in structural proceedings (Brasil, 2023, pp. 372, 382). This argument is directly connected to the judgment analyzed here. Reports, open data, digital publication, visual communication, and online access are mechanisms that transform technological infrastructure into an instrument of environmental accountability. In this sense, the use of digital tools in structural environmental litigation cannot be reduced to procedural modernization. It has democratic and constitutional implications. Digital publication of reports, online availability of data, visual presentation of indicators, and remote access to information may reduce informational asymmetries and strengthen participation by civil society, scientific organizations, affected communities, and oversight bodies. However, technology must be used as a means of inclusion, not as a new barrier. The effectiveness of open data depends on accessibility, clarity, usability, and the capacity of affected groups to understand and use the information disclosed (Brasil, 2023, pp. 370-372; Brasil & Queiroz, 2019, pp. 78-81). The reports required in the joint judgment therefore perform at least four constitutional functions. First, they produce visibility by making governmental action public. Second, they enable measurement by connecting actions to goals, indicators, schedules, and results.

Third, they allow accountability by making it possible to compare state commitments with concrete implementation. Fourth, they foster participation by providing society with the information needed to monitor environmental policies and demand institutional correction (Brazilian Federal Supreme Court, 2024a, pp. 6-9; Brazilian Federal Supreme Court, 2024b, pp. 7-9). These functions reveal why reports and open data may be understood as structural remedies. The same conclusion applies to visual communication. By requiring that information be presented, whenever possible, through maps, graphs, and other visual tools, the Federal Supreme Court recognized that transparency depends not only on the publication of data, but also on the communicative form through which such data are made accessible (Brazilian Federal Supreme Court, 2024a, pp. 8-9; Brazilian Federal Supreme Court, 2024b, pp. 8-9). This is particularly relevant in environmental matters, where technical data may be difficult for the general public to understand. Visual communication can translate complex information into forms that facilitate social control, scientific analysis, and public debate. The connection between structural procedure and environmental protection also justifies the need for flexibility.

Bambirra and Brasil (2021, p. 17) emphasize that the implementation of structural decisions cannot be compared to the time of ordinary proceedings because complex cases require planning, reasonable time, and flexible measures capable of addressing problems that arise during implementation. The Amazon rainforest deforestation case confirms this argument. The reduction of illegal deforestation cannot be achieved by a single judicial act. It depends on progressive implementation, institutional coordination, budgetary capacity, enforcement measures, data production, and continuous monitoring. Accordingly, the joint judgment of ADO no. 54-DF and ADPF no. 760-DF demonstrates that environmental transparency may operate as a structural remedy when it is integrated into a broader architecture of judicial monitoring, institutional planning, and social oversight. Reports, open data, indicators, visual communication, and digital publication are not accessory elements of the decision. They are instruments through which the constitutional duty to protect the Amazon becomes observable, measurable, and contestable. This is the point at which environmental transparency becomes a mechanism of constitutional accountability.

Thus, it shows that the protection of the Amazon rainforest depends not only on State action, but also on the public visibility, social controllability, and institutional accountability of that action.

3. CLOSING OBSERVATIONS

This researchr aimed to analyze environmental transparency as a constitutional remedy in the joint judgment of Direct Action of Unconstitutionality by Omission No. 54-Federal District (ADO no. 54-FD) and Allegation of Breach of Fundamental Precept No. 760-Federal District (ADPF no. 760-FD) by the Brazilian Federal Supreme Court. The survey focused especially on monthly reports, open data, public indicators, visual communication, and social oversight as mechanisms for monitoring the implementation of environmental public policies against illegal deforestation in the Amazon rainforest. From this perspective, the study sought to demonstrate that environmental transparency cannot be reduced to a merely administrative duty of publicity, since it may operate as an institutional mechanism for making constitutional environmental duties visible, measurable, and democratically controllable.

The research problem was formulated around the following question: can the Federal Supreme Court's requirement of clear, objective, accessible, and periodically updated environmental information be understood as an autonomous constitutional instrument for implementing the fundamental right to an ecologically balanced environment? The analysis developed throughout the investigation allows this question to be answered affirmatively. The judgment examined does not treat transparency as a secondary or accessory element of environmental management. Rather, it places transparency at the center of the structural response to state omission, institutional insufficiency, and the lack of effectiveness in environmental public policies. The research hypothesis is therefore confirmed. In the joint judgment of ADO no. 54-FD and ADPF no. 760-FD, environmental transparency was not treated merely as an ordinary administrative obligation, but as a structural constitutional remedy capable of connecting judicial review, institutional planning, democratic participation, and the effective control of environmental public policies.

The requirement of reports, open data, indicators, visual resources, and social oversight demonstrates that the Federal Supreme Court sought to create conditions for continuous monitoring of state action without directly replacing the Executive Branch in the technical formulation and implementation of environmental policy. The first section demonstrated that the right to an ecologically balanced environment has both substantive and procedural dimensions. The substantive dimension requires the State to prevent environmental degradation, protect biodiversity, control illegal deforestation, preserve ecological processes, and safeguard the rights of present and future generations. The procedural dimension, in turn, requires access to information, public participation, reasoned decision-making, institutional accountability, and access to administrative and judicial mechanisms. These two dimensions are interdependent, since environmental protection becomes fragile when substantive State duties are not accompanied by transparency, participation, and public control. The second section confirmed that reports, open data, and social oversight can be understood as structural remedies in environmental constitutional litigation.

In complex environmental disputes, such as illegal deforestation in the Amazon rainforest, the problem is not limited to a single unlawful act or an isolated administrative failure. It involves cumulative omissions, institutional fragmentation, budgetary insufficiency, discontinuity of public policies, insufficient enforcement, and lack of public accountability. For that reason, the judicial response must also be structural, prospective, and capable of sustaining compliance over time. The analysis showed that the reports required by the Brazilian Federal Supreme Court perform several constitutional functions. They make governmental action visible, connect measures to goals and indicators, allow the comparison between state commitments and concrete results, and provide society with information necessary for public oversight. Open data, in turn, expands the democratic function of transparency because it allows independent verification, scientific analysis, institutional control, and social participation. Visual communication, such as maps and graphs, reinforces accessibility by translating technical environmental information into forms that can be more easily understood by citizens and affected communities.

The study also demonstrated that social oversight is essential for the effectiveness of environmental governance. The protection of the Amazon rainforest cannot depend exclusively on internal administrative evaluation or isolated judicial commands. Civil society organizations, scientific institutions, Indigenous peoples, traditional communities, citizens, and oversight bodies must have access to reliable, updated, and understandable information in order to evaluate whether public authorities are effectively fulfilling their constitutional duties. Thus, transparency strengthens environmental democracy by allowing society to participate in the monitoring of policies that affect diffuse, collective, and intergenerational interests.

The hypothetical-deductive method was fundamental to the development of the research. The investigation began with the general premise that the protection of environmental rights, especially in cases involving complex public policies and structural omissions, depends not only on substantive state action, but also on procedural guarantees of access to information, participation, and accountability. From this premise, the research examined whether the judicial orders issued in ADO no. 54-FD and ADPF no. 760-FD confirmed the hypothesis that transparency could function as a constitutional remedy. The documentary analysis of the judgment, the qualitative examination of its operative provisions, and the theoretical reconstruction of the relationship between environmental constitutionalism, open government, and structural litigation confirmed the validity of the proposed hypothesis.

The importance of the hypothetical-deductive method lies precisely in its capacity to connect the theoretical premise of the procedural dimension of environmental rights with the concrete content of the Brazilian Federal Supreme Court's decision. The method allowed the research to move from a general constitutional assumption to the specific examination of judicial measures imposed in a complex environmental dispute. It also made it possible to verify whether the Federal Supreme Court's requirements of reports, open data, indicators, visual communication, and social oversight were compatible with the concept of transparency as a structural constitutional remedy. In this regard, the method provided coherence between the research problem, the hypothesis, the documentary analysis, and the results achieved.

The results achieved indicate that the Brazilian Federal Supreme Court broadened the meaning of environmental protection by connecting ecological effectiveness to transparency, institutional capacity, public participation, and democratic monitoring of State action. The joint judgment of ADO no. 54-FD and ADPF no. 760-FD shows that the effectiveness of the fundamental right to an ecologically balanced environment requires more than formal plans, generic commitments, or isolated administrative measures. It requires verifiable data, objective goals, periodic evaluation, accessible communication, institutional coordination, and mechanisms that allow society to verify whether the State is effectively acting against illegal deforestation.

Therefore, the main contribution of this investigation is to affirm that environmental transparency may be understood as a constitutional remedy in structural environmental litigation. Reports, open data, public indicators, visual communication, and social oversight do not replace environmental inspection, sanctions, budgetary execution, or institutional strengthening. However, they make these measures publicly visible, measurable, contestable, and subject to democratic control. In this sense, transparency operates as a bridge between constitutional norms and administrative implementation, between judicial review and institutional planning, and between environmental governance and social accountability.

In conclusion, the hypothesis proposed in the research is confirmed. In the joint judgment of ADO no. 54-FD and ADPF no. 760-FD, environmental transparency was transformed into a structural instrument of constitutional accountability. By requiring accessible information, periodic reports, open data, indicators, and mechanisms of social oversight, the Brazilian Federal Supreme Court contributed to the construction of a model of environmental governance in which the protection of the Amazon rainforest depends not only on the existence of State action, but also on the public visibility, democratic controllability, and institutional accountability of that action.

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CHAPTER 2
BETWEEN LEGISLATIVE AMBITION AND
PRACTICAL IMPLEMENTATION: THE LEGAL
ARCHITECTURE OF MOROCCO'S
ENVIRONMENTAL PROTECTION STRATEGY IN
THE FACE OF SUSTAINABLE DEVELOPMENT
CHALLENGES

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INTRODUCTION

The problem of environmental crisis has become one of the most acute issues of the twenty-first century, affecting all spheres of life across the globe. Issues of climate change, biodiversity loss, pollution, and resource exhaustion have forced countries to reevaluate their development models and develop sustainable ones. In this context, Morocco can be considered one of the leading countries in the African and Mediterranean region, which has a rather high degree of political will to promote sustainable development and environmental protection.

Indeed, the geographic location of the country in terms of its position between the Atlantic Ocean and the Mediterranean Sea, as well as a great diversity of landscapes, from mountains to the Sahara Desert, the sensitivity to climate change impacts, such as water shortage and desertification, make the problems of environmental protection one of the most critical issues for Morocco. Having joined a number of international environmental agreements, such as the UNFCCC, CBD, and UNCCD, the Moroccan government confirms its participation in world efforts for environmental protection.

The key element of Morocco's environmental policy is the adoption of the National Strategy for Environmental Protection and Sustainable Development (2017-2030). This document, elaborated by the Ministry of Energy, Mining, Water, and Environment, was developed to overcome the multidimensional environmental issues while stimulating the country's sustainable economic growth. It can be stated that the elaboration of this strategy was another step in the process of transitioning towards a sustainable economy.

The purpose of the present paper is to conduct an extensive evaluation of the Moroccan strategy of environmental protection and sustainable development. In particular, the chapter will include a detailed analysis of the legal framework that supports Morocco's environmental efforts and an examination of its projects that promote sustainable development. At the same time, this chapter contains some suggestions about improving the country's efforts to preserve the environment and achieve sustainable development.

1. TOWARDS A REFINEMENT OF ENVIRONMENTAL PROTECTION LAWS

A large number of legislations exists in Morocco to protect the environment. The objective of the strategy of the country is to complete the legislation in relation to the protection of the environment so that an effective framework is formed for resource management.

Law 11-03 on Environmental Protection and Implementation

Law No. 11-03 relating to the protection and implementation of the environment constitutes a fundamental pillar for the evolution and modernization of the environmental inspection, control, and surveillance process. It establishes the guiding principles and encompasses all environmental domains. As a framework for implementing environmental regulations, it applies to all sectors and also serves as a reference for areas not covered by specific sectoral laws. However, the industrial sector, particularly classified establishments, is currently not subject to any legal obligation to develop hazard studies, emergency plans, or risk prevention plans, due to the absence of implementing texts for Law 11-03, particularly its Articles 51 to 53. To fill this gap, Morocco seeks to develop and promulgate the necessary texts to ensure better prevention and management of environmental risks.

Law 28-00 on Waste Management

Law No. 28-00 relating to waste management and disposal, as amended and supplemented by Law No. 23-12, aims to protect human health, fauna, flora, and the environment against the harmful effects of waste. The improvement of implementation and control devices, as well as the integration of extended producer responsibility, in accordance with Article 8 of the framework law on the national charter for the environment and sustainable development, are necessary to strengthen this law.

Law 22-07 on Protected Areas

Law No. 22-07 relating to protected areas establishes the basic rules and general principles of national policy in the field of environmental protection and enhancement, in order to better respond to international criteria and adapt to the evolution of natural heritage protection, both at the regional and international levels. It is essential to develop a legal framework for the protection of sites of biological and ecological interest and to integrate the planning and management requirements defined in Law 22-07.

Law 29-05 on Protection of Wild Flora and Fauna Species

Law No. 29-05 relating to the protection of wild flora and fauna species and the control of their trade aims to establish a legal framework dedicated to the protection of wild fauna and flora species, in order to put an end to their intensive and irrational exploitation, and to regulate their commercialization at the international level, in accordance with international conventions on environmental protection, particularly the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). The implementation of the implementing texts of this law is crucial for its effectiveness.

Law 13-03 on Air Pollution Control

Law No. 13-03 relating to the fight against air pollution aims to prevent and combat emissions of atmospheric pollutants likely to harm human health and the environment. It specifies the means of combating air pollution as well as the sanction procedures in case of damage or serious pollution, and provides for incentive measures for investment in air pollution prevention projects. The publication of implementing decrees relating to the following provisions is necessary: the zones where quality and quantity standards are prescribed, the modalities of air quality monitoring, the standards and characteristics of fuels and combustibles used, as well as the cases and circumstances in which the administration may take emergency measures.

Law 12-03 and Law 49-17 on Environmental Impact Assessment

Law No. 12-03 relating to environmental impact studies (EIE) aims to systematically and preliminarily evaluate the possible repercussions, as well as the direct and indirect, temporary and permanent effects of an economic project on the environment. It aims to eliminate, mitigate and compensate for the negative repercussions of the project, to enhance and improve its positive impacts on the environment, and to inform the concerned population. To improve this law, it is necessary to include the following elements: revision of the list of subject projects, excluding small-scale projects (to be defined) with known impacts, for which a specifications document will suffice instead of a full EIE; establishment of a clear procedure for environmental monitoring and control; adoption of strategic environmental assessment of policies, plans and programs. It is in this sense that Law 49-17 relating to environmental assessment was enacted. It remedies certain shortcomings recorded during the implementation of Law 12-03, particularly the non-submission of numerous polluting projects to environmental impact assessment, by updating the list of projects subject to EIE. It also establishes the procedure and modalities for examining strategic environmental assessment as well as the use of public consultation in this process.

Law 13-09 on Renewable Energies

Law No. 13-09 relating to renewable energies, as amended and supplemented by Law No. 58-15, establishes a legal framework aimed at facilitating the realization and operation of electricity production installations from renewable sources by public or private entities, as well as natural or legal persons. It defines the general principles to be respected and the applicable legal regime, including the marketing and export of the produced energy. In order to stimulate the development of these installations, the law provides for the establishment of an adapted and incentive financial and fiscal system. It is crucial to publish the decree defining the envelopes and trajectories relating to the opening of medium voltage, as well as the decree fixing the conditions and modalities of access to the low voltage electrical network. However, for such legislation to be fully effective, it will be necessary to enforce it properly and produce numerous implementing documents.

Some of the legislation that has been passed has since undergone improvement due to future demands and environmental considerations. It is imperative that the competent authorities accelerate this process in order to strengthen the legal and institutional framework for environmental protection in Morocco. The success of this strategy will also depend on the awareness and involvement of all actors, whether public, private or citizens. Innovation and international cooperation will play a key role in adapting to new environmental challenges. Morocco thus has a unique opportunity to consolidate its position as a regional leader in sustainable development and environmental protection.

2. FROM PLAN TO ACTION: OPERATIONALIZING THE STRATEGY THROUGH PROJECTS

Morocco is one of the countries most threatened by the effects of greenhouse gases at all levels, which has pushed it to show solidarity with the international community in the search for effective solutions to these global problems threatening the environment. This solidarity was manifested notably by hosting the seventh Conference of the Parties on climate change in 2001 and by the presidency of the Moroccan delegation at the Earth Summit in Rio in 1992. Morocco has also engaged in environmental protection by adopting an integrated approach to develop an environmental strategy involving all concerned ministries and institutions, as well as businesses and civil society leaders. The national environmental strategy has defined several immediate objectives, among which: establishing an objective and precise diagnostic report on the national environmental situation and future forecasts, in connection with the objectives of the economic and social development plan and the national territorial planning plan; creating a permanent body for monitoring the state of the environment, the "National Environment Observatory of Morocco"; and integrating environmental education into school curricula.

2.1 Energy Sector: Renewable Energy Transition

The increasing demand for energy and the negative results it has caused on the environment have led to encouraging the use of ecologically clean, economically and socially acceptable methods and techniques, to rationalize energy consumption and improve its efficiency in various economic sectors, particularly energy-intensive activities in transformation industries. The use of renewable energy sources is undoubtedly the only way to guarantee a sustainable and safe future for all. This is why the government has given increasing importance to renewable energies, defining a set of characteristics and objectives to promote alternative energy and reduce dependence on traditional energy sources such as oil or coal, following a global awareness of the need to combat the effects and repercussions of climate change.

Aware of its vast potential in solar, wind, geothermal and biomass energy to develop renewable energies, and given its dependence on the outside world to meet its essential energy needs, particularly in oil, as well as its vulnerability as a country that still does not produce enough energy to meet its consumption, Morocco has launched a vast project aimed at providing the country with clean energy production capacity meeting both economic and social development objectives respectful of the environment. The legislator initiated the adoption of laws governing this field and put in place a new energy policy since 2009 in order to promote the establishment of strategic partnerships with reference actors, to transfer technologies, to develop new trades and to promote research and development activities.

Law No. 13-09 relating to renewable energies has clarified the rules for production and operation of electricity production plants from renewable energy sources by natural and legal persons, public or private, by establishing the general rules to which they must comply and the applicable legal regime, including in terms of marketing and export. To strengthen the mastery of the energy sector in our country, the legal framework was completed by Law No. 47-09, which aims to meet the challenges in terms of energy efficiency to improve its cost, and to mobilize renewable energy resources to provide access to clean energy in order to reduce polluting emissions in our country. This law draws clear and operational guidelines for the implementation of the new strategy in terms of energy efficiency.

Given the importance of energy efficiency and renewable energies on which Morocco relies as the main pillars of sustainable development, the Energy Development Fund was created under royal patronage in 2010, with an estimated capital of one billion US dollars, including 200 million from the Hassan II Fund, 300 million from the United Arab Emirates and 500 million from the Kingdom of Saudi Arabia.

According to the forecasts of the Economic, Social and Environmental Council concerning the integration of climate change provisions in public policies in 2015, renewable energies from wind (2 MW), solar (2 MW) and hydraulic (2 MW) sources were to represent 42% of electricity produced in 2020. This plan led to a significant expansion of wind and solar capacity during the following decade, with an increase in photovoltaic solar capacity of 16 times (although the initial base was low) and a six-fold multiplication of wind capacity in 2020. The Moroccan solar plan, once completed, will avoid the emission of 3.7 million tons of carbon dioxide per year, while the wind program will reduce annual CO₂ emissions by 5.6 million tons. The installations extend over an area of 10,000 hectares and will eliminate one million tons of oil per year, or about 500 million dollars, while reducing Morocco's annual CO₂ emissions by 3.7 million tons. In 2020, these installations were to cover 38% of Morocco's electricity needs and make the country a leader in renewable energy production. Ultimately, Morocco did not reach its target for 2020, with renewable energies representing 37% of total energy in 2020. However, the country has made considerable progress in this field.

Since then, Morocco has committed to increasing the share of renewable energies in electricity production to 52% by 2030 (20% solar, 20% wind and 12% hydraulic). Compared to many other countries, Morocco stands out for its efforts in the fight against climate change, its policies and commitments being close to the objective of limiting global warming to 1.5°C, according to an analysis by the Climate Action Tracker research group.

2.2 The Noor Ouarzazate Solar Complex

Among Morocco's flagship initiatives in renewable energy, the Noor Ouarzazate solar complex stands out for its scope and technological innovation.

Noor Ouarzazate, led by MASEN, is the largest solar complex in the world with a capacity of 580 MW, spread over more than 3,000 hectares and integrating four plants using diverse technologies (CSP and PV) and a research platform. Noor, I use cylindrical-parabolic collectors with a storage capacity of three hours, Noor II and Noor III, adopting CSP technology, have storage capacities of seven and eight hours respectively. Noor IV uses photovoltaic technology. These projects, with an investment of 24 billion dirhams, are accompanied by common infrastructures and have stimulated local socio-economic development. In addition to Noor Ouarzazate, the Noor solar plan includes plants in Midelt, Laâyoune, Boujdour and Tata for a total capacity of 2,000 MW. This plan, the first solar project developed within the framework of the Moroccan energy strategy, aims to increase the share of renewable energies in the national electricity mix to more than 52% by 2030, strengthening Morocco's energy security and contributing to the fight against climate change, while meeting the country's growing energy needs.

2.3 Agriculture Sector: Biodiversity Conservation and the Green Morocco Plan

After the Earth Summit in Rio de Janeiro, the preservation of the environment became an international strategic priority accompanying social and economic development. Biodiversity, an essential element of the environment, was one of the main subjects addressed and adopted at the Rio Conference with the ratification of the International Convention on Biodiversity. The signing of this convention by Morocco testifies to the paramount importance that the country attaches to its biological riches, including its ecosystems and living species, considered as the fundamental pillars of all economic and social growth. As an agricultural country with two maritime facades extending over 3,500 km of coasts, Morocco sees its agriculture, its plants, its marine resources and its phosphate as the bases of its economic and social policy. However, biodiversity in Morocco is subject to numerous pressures mainly due to social and economic factors such as the overexploitation of resources, the degradation of natural habitats by deforestation for urbanization (loss of 31,000 hectares of forests per year).

The destruction of wetlands and the pollution of biological environments resulting from inadequate infrastructure, threatening numerous species with extinction. According to national studies on biodiversity and nature reserves, several plant and animal species are in danger, including 1,617 plant species and 610 animal species, of which 86 marine species, 98 bird species and 18 mammal species.

Aware of the importance of biodiversity for the national economic fabric and in order to respect the commitments of the International Convention on Biodiversity, Morocco has put in place a strategy and a national action program for the protection of biodiversity. This initiative aims to protect, conserve and sustainably use biodiversity, thus reflecting Moroccan policy in terms of environment and sustainable development in general, and biodiversity in particular. In this framework, a national strategy and an action program for the conservation and sustainable use of biodiversity have been developed. Among the initiatives, the creation of a sperm bank to develop the in vitro fertilization process for endangered species, this initiative aims to compensate for losses due to various factors, including the massive slaughter of animals during religious festivals. The objective is to restore and preserve these endangered species by 2024, thus contributing to maintaining biodiversity and ensuring the sustainability of the country's natural ecosystems.

In addition to its contribution to environmental preservation, this biodiversity conservation strategy rests on five central objectives aimed at ensuring the preservation and sustainable use of biological resources. The first objective consists in the rational management and sustainable use of biological resources, with the implementation of measures guaranteeing that the exploitation of these resources does not exceed the regeneration capacities of ecosystems and the promotion of sustainable management practices in various economic sectors to protect biodiversity in the long term. The second goal pertains to the promotion of knowledge and training in the field of biodiversity. This objective will be accomplished through the promotion of science, which will aid in understanding the different ecosystems and endangered species as well as developing training programs for individuals who work in biodiversity conservation. Environmental awareness and education will form the focus of the third goal in the plan to protect and conserve biodiversity.

The goal will involve conducting public awareness campaigns to inform people of the significance of biodiversity and the challenges it faces, alongside incorporating environmental education in schools so that the next generation is prepared to take care of their surroundings. The strengthening of laws and institutions forms the basis of the fourth goal. This will be done through revising the legislative system to improve the protection of biodiversity and creating and strengthening institutions whose mandate entails biodiversity management. The fifth goal will aim at fostering international cooperation in relation to biodiversity by joining international treaties and programs and cooperating with international partners to help achieve environmental sustainability goals. Overall, the aforementioned goals will significantly contribute towards biodiversity preservation and will have great significance in global environmental protection.

2.4 The Green Morocco Plan

Alongside efforts in preserving biological diversity, the Moroccan government has also taken a number of initiatives with respect to the agriculture industry, through the Green Morocco Plan strategy. Such an approach has enabled swift modernization and also development of the agricultural industry in a balanced way.

The strategy is based on two major pillars; the first pillar focuses on utilizing private investments and mainly focuses on areas that have good potential in agriculture; whereas the second pillar is dependent on state intervention. Thanks to these efforts, the Moroccan agricultural sector has undergone a significant transformation, enabling rapid modernization and sustainable and equitable development.

2.5 Industry Sector: Industrial Acceleration and Environmental Challenges

Morocco seeks to improve its position at the international level by concentrating its support efforts on sectors with high export potential in order to improve the competitiveness of its export offers on the foreign market.

In this framework, the Industrial Acceleration Plan was adopted in 2014/2020 with two strategic objectives: the creation of 500,000 jobs, half from foreign direct investment and the other half from the renewal of the national industrial fabric, and the increase of the industry's share in the gross domestic product from 14% to 23%.

However, the national industrial acceleration strategy does not consider environmental risks and does not specifically include measures to reduce greenhouse gas emissions, such as promoting energy efficiency in production and clean technologies. Priority was given to industrial takeoff and job creation, to the detriment of the environment. This creates a lack of coherence between this plan and other plans aimed at preserving the environment.

In application of the polluter-pays principle, Morocco has equipped the 185 vehicle technical control centers with monitoring equipment. All these centers are equipped with smoke measurement devices for diesel vehicles and carbon monoxide analysis devices for gasoline cars. In addition, a vehicle renewal program for goods transport for others and mixed transport in rural areas has been put in place. This program will contribute to reducing greenhouse gas emissions from goods transport by 35%.

2.6 Environmental Degradation Costs and Strategic Vision

While reflecting on past successes, it is also important to consider strategic visions for the future in order to continue to progress towards sustainable development. The national strategy highlights the importance of concentrating efforts on the most affected areas or the most polluting industries. For example, this includes initiatives such as the purification of Oued Sebou or the reduction of water and air pollution in major cities such as Casablanca, Marrakech, Rabat, and Tangier, where 90% of wastewater is discharged without treatment, including 52% into the sea (370 million cubic meters of urban wastewater and 940 million cubic meters of industrial wastewater), only 2% of household waste is recycled or disposed of in controlled landfills, and 930,000 tons of industrial waste per year, of which 42% is concentrated in the Greater Casablanca region.

The objective of this strategy is to integrate environmental considerations into decision-making, prioritizing the health and well-being of populations, addressing the causes of pollution and encouraging research, information and training.

A study evaluating the cost of environmental degradation in Morocco, carried out by the Secretariat of State in charge of Sustainable Development in partnership with the World Bank in 2014, aimed to improve the previous study based on data from the year 2000. By comparing the results of the two studies, that of 2014 stood out for an abundance of essential information compared to the previous one, thus enabling a more complete evaluation of the impacts. The study revealed that the cost of environmental degradation in 2000 was 590 dirhams per inhabitant, while in 2014 this cost was reduced to 450 dirhams per inhabitant. This decrease is mainly due to the reduction of costs associated with water and waste. The cost of degradation in the water sector decreased by 60%, from 190 to 80 dirhams per inhabitant, while that of waste fell by 50%, from 80 to 40 dirhams per inhabitant. This improvement is explained by better management of the two sectors, made possible thanks to the implementation of the National Household Waste Management Program and the National Liquid Sanitation Program, whose implementation costs amount to 43 billion dirhams and 50 billion dirhams respectively.

2.7 Medium and Long-Term Objectives

These efforts are part of a global vision of environmental protection, with clear objectives to be achieved in the medium and long term. In the medium term, it aims to stabilize the level of environmental degradation and pollution levels. In the long term, it aims to reduce environmental degradation and pollution levels. To achieve these objectives, the Ministry of the Environment, with the help of the United Nations Development Programme, has developed a national action plan for environmental protection. The long-term strategy of Morocco aims to improve several critical environmental areas. Among these initiatives is the national water plan, which constitutes a roadmap for the national water strategy by 2030. This plan includes measures aimed at strengthening adaptation to risks related to climate change. For example, the construction of dams is envisaged to mobilize additional water resources.

Moreover, the use of unconventional water resources, such as seawater desalination and the reuse of treated wastewater, as well as the promotion of water economy in the agricultural, tourist and industrial sectors, are encouraged. A sustainable water management program is being implemented, including water-efficient agricultural practices and improving the efficiency of drinking water distribution networks. In addition, a cross-cutting action program is being developed to promote the exemplarity of the State in the framework of the implementation of the ecological management concept. To complete these efforts, regional studies are being carried out in order to develop regional sustainable development action plans, in addition to the regional development plans already in place. To date, four regions have already launched these studies: Tangier, Tetouan, Al Hoceima, Casablanca-Settat, and Fès-Meknès. Finally, the strategy encourages the transition to a green economy. This includes the creation of sorting and waste recovery centers in controlled landfills, thus contributing to sustainable waste management. However, it should be noted that the assumptions used to evaluate water resources do not take into account the past and future impacts of climate disturbances on precipitation, which could compromise the objectives of the national water strategy. To meet the requirements of supply management and the needs of economic, social and environmental development, it is essential to accelerate the establishment of a national water information system, in accordance with the national strategy, in order to collect and enrich knowledge and information on water and climate. If Morocco succeeds in integrating the environmental dimension into public policies for integrated water resource management, it will have real opportunities to develop an integrated and complete industrial sector. This includes trades related to water pollution, air and waste, and the integration of this sector into the Industrial Acceleration Plan launched in 2014. It is crucial to mobilize all professional actors, consulting firms and researchers working in the fields of surface water mobilization, seawater desalination, water treatment and distribution, as well as the reuse of treated wastewater. However, to guarantee the success of this strategy, it is necessary to evaluate it continuously. Indeed, its implementation will be progressive and continuous, requiring periodic evaluation to ensure the continuous improvement of the defined development projects.

This evaluation is based on sustainable development indicators allowing the measurement of the progress of the commitments made. If necessary, these indicators will allow the reorientation and adjustment of objectives according to national priorities and the sustainable development objectives adopted by the international community.

CONCLUSION

Upon scrutiny of the Moroccan National Strategy for Environmental Protection and Sustainable Development (2017-2030), there seems to exist an extensive legislative and policy structure that seeks to harmonize environmental protection with socio-economic development in the country. Though significant strides have been made, particularly in terms of the development of renewable sources of energy and inclusion of environmental considerations within some sectors of the economy, lack of implementation continues to hinder the realization of the stated objectives. Delay in drafting implementing decrees, poor coordination among institutions, and conflicts between development goals and environmental issues remain key problems. Effective measures to address the weaknesses mentioned above will be crucial for the realization of Morocco's environmental objectives within the stipulated timeframe.

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CHAPTER 3
CLIMATE CHANGE AND STATE RESPONSIBILITY
UNDER THE LAW OF THE SEA: EMERGING
HUMAN RIGHTS DIMENSIONS

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INTRODUCTION

Climate change is now one of the most alarming challenges to contemporary international law, particularly in relation to the governance and protection of the oceans. Rising sea levels, ocean acidification, and the increasing frequency of extreme weather events have intensified pressure especially on marine ecosystems and coastal communities. These developments raise complex legal questions about the adequacy of existing international legal frameworks, especially the law of the sea, in addressing climate-related harm to the marine environment. While the United Nations Convention on the Law of the Sea (UNCLOS) establishes broad obligations for the protection and preservation of the marine environment, its capacity to respond effectively to the diffuse and growing negative impacts of climate change remains uncertain (*United Nations, 1982*).

The law of the sea was not framed with climate change in mind. Its core provisions reflect a regulatory structure focused on maritime zones, navigation, resource exploitation, and environmental protection primarily in the context of identifiable sources of pollution. Climate change, on the other side, actually results from cumulative global emissions and produces long-term, transboundary harm that is difficult to attribute to an individual or group of states. This creates real challenges for the application of traditional principles of state responsibility, including attribution, causation, and reparation. Consequently, although states have clear environmental obligations under international legal framework, enforcing those responsibilities for climate-related marine harm remains legally and politically complex and uncertain also.

The consequences of climate change are not confined to the marine context but extend beyond environmental degradation. Coastal erosion, declining fisheries, and the inundation of low-lying areas directly affect human populations that depend on the oceans for their survival and livelihoods. These impacts increasingly engage international human rights law, particularly rights related to life, health, food, and an adequate standard of living. Although literature widely discusses climate change impacts on marine ecosystems, limited scholarly attention has been given to the integration of human rights law within the law of the sea framework for enforcing state responsibility.

Existing research focuses more on environmental obligations but seldom addresses accountability for human harm caused by marine climate degradation. This chapter tries to examine the evolving relationship between climate change and state responsibility under the law of the sea, and international human rights law. It argues that while UNCLOS establishes important obligations for the protection of the marine environment, its enforcement mechanisms are limited in addressing climate-related harm. Human rights law, with its focus on individual and collective harm and its developing jurisprudence on extra-territorial obligations, offers an additional lens through which state responsibility for marine climate impacts can be understood and strengthened. Rather than treating these legal regimes as separate or fragmented, this chapter adopts an integrated approach that highlights their potential complementarity.

The analysis focuses on three interconnected questions. First, what obligations do states have under the law of the sea to address climate-related harm to the marine environment? Second, how do principles of state responsibility apply in the context of climate change, where harm is collective and causation is scientifically complex? Third, to what extent can international human rights law contribute to filling accountability gaps in the law of the sea framework? By addressing these questions, the chapter seeks to clarify the legal foundations of state responsibility in the face of climate-induced marine harm.

The chapter proceeds in eight sections. Following this introduction, the second one outlines the principal ways in which climate change affects the marine environment, with particular attention to legal relevance rather than scientific detail. The third section examines state obligations under UNCLOS and customary international law concerning the protection of the marine environment. The fourth section analyzes the challenges of applying the law of state responsibility to climate-related marine harm. The fifth section explores the human rights implications of marine climate impacts, focusing on vulnerable coastal and island communities. The sixth section considers the convergence of the law of the sea and human rights law, assessing whether human rights frameworks can strengthen accountability. The seventh section discusses key challenges and future directions, and the final section concludes by reflecting on the broader implications for international ocean governance.

This chapter looks at climate change from both the law of the sea and human rights law perspectives. It adds to discussions about how international law can adapt to global environmental crises. The focus is on legal approaches that protect the environment and address human vulnerability, while still following the established rules of international law. By analyzing the interaction between the law of the sea and international human rights law, this chapter highlights an increasingly important but still developing approach to climate-related accountability climate change and the marine environment.

Climate change has profound and measurable effects on the marine environment, many of which have direct legal significance under international law. The oceans actually absorb a substantial portion of anthropogenic greenhouse gas emissions, leading to physical and chemical changes that threaten marine ecosystems and the communities that depend on them (Intergovernmental Panel on Climate Change [IPCC], 2019). These changes challenge existing legal frameworks by producing harm that is gradual, cumulative, and transboundary in nature.

One of the most visible impacts of climate change on the oceans is raising sea level. Climate change induced sea level rise- driven by thermal expansion and melting glaciers and ice sheets is one of the most visible effects of global warming, and it poses significant challenges to the law of the sea by affecting coastal baselines, maritime zones, and territorial integrity for coastal and island states. While UNCLOS establishes rules for the determination of maritime zones, it does not address the consequences of climate-induced changes to coastlines, creating uncertainty regarding the stability of maritime entitlements explicitly. Ocean acidification is another less known yet horrific impact of climate change. As the oceans absorb carbon dioxide from the atmosphere, seawater becomes more acidic, adversely affecting coral reefs, shell-forming organisms, and broader marine biodiversity. This degradation undermines ecosystem services such as fisheries and coastal protection, which are essential for food security and economic stability in many regions (Intergovernmental Oceanographic Commission of UNESCO [IOC-UNESCO], 2026). From a legal perspective, ocean acidification can be considered a form of marine pollution or environmental harm under international environmental law, even though its main causes come from land-based activities and global emissions.

Climate change also affects marine living resources through rising ocean temperatures and altered circulation patterns. These changes disrupt fish migration routes and reduce fish stocks, placing pressure on fisheries management systems. For states that rely heavily on marine resources, declining fisheries directly affect livelihoods and food availability (National Oceanic and Atmospheric Administration [NOAA Fisheries], n.d.). Such impacts are relevant to international obligations concerning the sustainable use of marine resources and cooperation among states, as recognized under UNCLOS and related instruments.

Beyond environmental degradation, the effects of climate change on the marine environment have significant human consequences. Coastal communities face increased exposure to storms, flooding, and loss of habitable land. Small island developing states are particularly vulnerable, as their geographic and economic dependence on the oceans magnifies the risks posed by climate-related marine harm (United Nations, 1994). These human impacts underscore the connection between marine environmental protection and broader goals of human well-being and dignity.

Climate-related harm to the marine environment is difficult to assess legally because it is diffuse in nature. Unlike traditional marine pollution, climate change does not come from a single, clearly identifiable source, nor does it cause immediate or localized damage. Instead, the harm develops gradually over time as a result of the combined actions of many States. This makes it challenging to apply established legal principles such as attribution and causation, which are essential elements of the law of State responsibility.

For this reason, understanding how climate change affects the marine environment is crucial when evaluating whether existing legal obligations under the law of the sea are sufficient. These environmental impacts form the factual basis for determining State responsibility and accountability. The next section therefore examines the obligations of States under UNCLOS and customary international law to protect and preserve the marine environment in response to these evolving challenges.

1. STATE OBLIGATIONS UNDER THE LAW OF THE SEA

The law of the sea establishes a comprehensive framework governing state conduct in relation to the oceans, including obligations concerning environmental protection. Central to this framework is the United Nations Convention on the Law of the Sea (UNCLOS), which imposes both general and specific duties on states to protect and preserve the marine environment. Although UNCLOS was adopted before climate change became widely recognized as a global threat, its rules on environmental protection offer a key legal foundation for evaluating States' responsibilities regarding climate-related harm to the oceans.

Article 192 of UNCLOS sets out "States have the obligation to protect and preserve the marine environment" (United Nations, 1982). This rule is generally seen as part of customary international law and sets a baseline duty for all States, no matter their maritime zone. The obligation is stated in broad terms and is not limited to specific sources of pollution or types of harm. Because of this broad scope, it can cover environmental damage caused by climate change, even though the Convention does not specifically mention greenhouse gas emissions or global warming.

Article 194 of UNCLOS sets out more specific obligations for States, requiring them to take all necessary measures to prevent, reduce, and control pollution of the marine environment, using the best practicable means available. Article 194(2) further requires States to ensure that any activities under their jurisdiction or control do not cause harm to other States or to the marine environment beyond national jurisdiction (United Nations, 1982). These provisions reflect the principle of prevention and the duty to avoid transboundary harm, both of which are well established in international environmental law.

Applying these obligations to climate change raises difficult questions of interpretation. Traditionally, marine pollution has been linked to clearly identifiable sources, such as oil spills, dumping at sea, or land-based discharges. Climate change, by contrast, arises from cumulative emissions, mainly produced on land, which affect the marine environment indirectly and over time.

Despite this distinction, several scholars argue that the definition of marine pollution under UNCLOS is sufficiently broad to include the introduction of substances or energy that result in harmful effects to marine ecosystems, which may encompass greenhouse gas emissions and their oceanic impacts.

Beyond setting substantive duties, UNCLOS places strong emphasis on cooperation among States in dealing with problems affecting the marine environment. Article 197 requires States to cooperate at both the global and regional levels to protect and preserve the marine environment. This obligation is especially important in the context of climate change, where effective solutions depend on collective action rather than individual State efforts. Such cooperation may include sharing information, conducting joint scientific research, and developing international rules and standards (United Nations, 1982).

UNCLOS also incorporates a due diligence standard in the implementation of environmental obligations. Due diligence requires states to adopt and enforce appropriate laws, regulations, and administrative measures to prevent environmental harm. It does not impose strict liability for environmental damage but instead assesses whether a state has taken reasonable steps in light of its capabilities and knowledge (Takano, 2018). In the climate change context, this standard raises questions about the extent to which states are required to regulate emissions and other activities that contribute to marine harm.

Despite these obligations, UNCLOS provides only limited mechanisms for enforcement. In practice, compliance depends largely on State reporting, diplomatic engagement, and dispute settlement procedures, which are often used infrequently. Although international courts and tribunals, including the International Tribunal for the Law of the Sea (ITLOS), have helped clarify environmental duties, their involvement in addressing climate-related marine harm has so far been limited (Open Society Justice Initiative [OSJI], 2024). As a result, this enforcement gap reduces the practical effectiveness of UNCLOS in responding to the impacts of climate change on the marine environment.

In sum, the law of the sea imposes clear obligations on states to protect and preserve the marine environment, many of which are relevant to climate-related harm. However, the indirect nature of climate impacts, combined with the collective character of emissions, complicates the application of these obligations in practice. These challenges bring into focus the limits of the law of the sea framework and set the stage for examining how principles of state responsibility apply in the context of climate-induced marine damage. The following section addresses these issues by analyzing attribution, causation, and responsibility under general international law.

2. STATE RESPONSIBILITY FOR CLIMATE-RELATED MARINE HARM

The general law of state responsibility provides the framework for determining when a state may be held internationally responsible for wrongful acts that cause harm. Under the Articles on Responsibility of States for Internationally Wrongful Acts (ARSIWA), a State incurs responsibility when conduct that can be attributed to it amounts to a breach of an international obligation. However, applying this framework to climate-related harm to the marine environment raises serious legal and practical difficulties.

A primary difficulty lies in the issue of attribution. Climate change results from the cumulative greenhouse gas emissions of multiple states over extended periods. Unlike traditional cases of marine pollution, where harm can often be traced to a specific activity or incident, climate-related marine harm cannot easily be linked to the conduct of a single state. Nevertheless, attribution under international law does not require exclusivity. Conduct may be attributable to a state where activities under its jurisdiction or control contribute to a breach of an international obligation, even if other states are also involved. This opens the possibility of shared or multiple responsibility, rather than absolving states of responsibility altogether.

Causation presents a related but separate challenge. Traditionally, international law requires a sufficient causal link between a wrongful act and the damage suffered. In cases involving climate change, establishing this link is difficult due to scientific uncertainty, time delays, and the global nature of the harm.

However, international jurisprudence has increasingly accepted that causation does not always need to be direct or immediate in environmental cases. Instead, a reasonable connection between conduct and harm, supported by scientific evidence, may be enough. This developing approach indicates that climate-related harm to the marine environment should not be excluded from legal responsibility merely because it is complex.

The principle of due diligence is central to assessing State responsibility in this context. As noted earlier, environmental obligations under UNCLOS are obligations of conduct, not of guaranteed results. A State may therefore breach its obligations if it fails to take reasonable measures to prevent or reduce harm, even where damage occurs despite some efforts. In the climate context, this raises important questions about whether States have adopted adequate regulatory and policy measures to limit emissions and protect the marine environment, taking into account their capabilities and available scientific knowledge.

Another important issue is that climate change does not harm just one country, it harms everyone. The traditional rules of international law were designed to deal with situations where one country directly harms another country, like a dispute between two neighbours. But these rules do not work well when the damage is happening to shared spaces like the high seas, which belong to no single country. When climate change damages the ocean, it is not just one country's problem. The harm spreads across the entire ocean and affects all countries and all people around the world. Because of this, no single country can easily step forward in a court and say "this damage was done specifically to me."

This is why legal scholars have suggested that the rules need to change. They argue that protecting the ocean should be treated as a duty that every country owes to the whole world, not just to its immediate neighbours. In legal terms, this is called an *erga omnes* obligation, which simply means an obligation owed to everyone. This broader way of thinking fits well with the goals of UNCLOS and international environmental law, both of which were created to protect the ocean for the benefit of all of humanity, not just for individual countries.

Questions relating to remedies further expose the limits of existing legal frameworks. Under the Articles on Responsibility of States for Internationally Wrongful Acts (ARSIWA), a State found responsible must cease the wrongful conduct and provide full reparation, which may take the form of restitution, compensation, or satisfaction. In climate-related cases, restitution is often not possible, while compensation raises complex issues of valuation and distribution of harm. Although these practical difficulties do not remove State responsibility, they underline the need for innovative remedial approaches, such as declaratory relief and guarantees of non-repetition.

Recent developments in climate litigation and advisory proceedings indicate a growing willingness of international bodies to engage with these issues. While no international court has yet imposed responsibility on a state specifically for climate-related marine harm, emerging jurisprudence suggests an increased openness to addressing climate change within existing legal frameworks (McKenzie, 2024). Advisory opinions, in particular, offer a forum for clarifying legal obligations and responsibility without the procedural constraints of contentious cases.

In summary, applying the law of State responsibility to climate-related harm to the marine environment involves doctrinal tension rather than legal impossibility. While issues of attribution, causation, and remedies present serious difficulties, they do not make State responsibility irrelevant. Instead, these challenges highlight the limits of traditional legal approaches and the need for further interpretive development. These constraints also help explain the growing focus on international human rights law as a complementary framework for addressing the human impacts of climate-related marine harm. The following section therefore examines these human rights implications in greater detail.

3. HUMAN RIGHTS IMPLICATIONS OF MARINE CLIMATE HARM

The impacts of climate change on the marine environment have serious consequences for human populations, especially for people living in coastal and island areas.

These effects are closely linked to international human rights law, as climate-related harm to the oceans can threaten rights essential to human dignity, including the rights to life, health, food, and an adequate standard of living. Recognizing these human impacts also shows the limits of relying on environmental law alone to address the full range of harms caused by climate change.

One area of concern is the threat to the right to life. Rising sea levels, increased storm surges, and coastal flooding pose direct risks to human life, particularly in low-lying and small island states. These risks are compounded by the vulnerability of populations with limited adaptive capacity, such as communities dependent on subsistence fishing. From a legal perspective, states have obligations to respect, protect, and fulfill the right to life under international human rights treaties, including the International Covenant on Civil and Political Rights (ICCPR). Where state actions or omissions exacerbate climate-related threats to life, human rights law may provide a complementary basis for accountability.

Climate-related marine harm also affects economic and social rights. The degradation of fisheries, loss of coastal land, and damage to livelihoods undermine the right to an adequate standard of living, including access to food and housing. States that fail to implement measures to mitigate or adapt to climate impacts may be in breach of their obligations under the International Covenant on Economic, Social and Cultural Rights (ICESCR), particularly in relation to progressive realization and non-discrimination. Human rights frameworks emphasize the protection of vulnerable groups, which is especially relevant in contexts where climate impacts are unevenly distributed.

The principle of extraterritorial human rights obligations has gained increasing relevance in the context of climate change. State activities that contribute to greenhouse gas emissions or environmental degradation can affect the human rights of populations beyond national borders. This reality challenges the traditional territorial orientation of human rights law and emphasizes the importance of international cooperation in responding to climate-induced harm to the marine environment.

It also illustrates the complementary relationship between human rights law and the law of the sea: while UNCLOS imposes duties on states to protect the marine environment, human rights law focuses on the impacts of environmental harm on individuals and communities.

Recent jurisprudence further demonstrates how human rights bodies are beginning to address environmental and climate-related harm. The Human Rights Council and various regional human rights courts have increasingly recognized that environmental degradation and climate change can trigger states' human rights obligations (Inter-American Court of Human Rights, 2025). Although these developments remain at an early stage, they provide an important normative foundation for understanding the human consequences of climate-related marine harm and for enhancing state accountability beyond the limits of traditional environmental law frameworks.

In conclusion, climate change-induced harm to the oceans is not just an environmental issue but a human rights concern with profound legal implications. Recognizing this dimension allows for a more comprehensive assessment of state obligations, highlighting the interconnection of environmental protection and human well-being. The following section analyses the growing convergence between the law of the sea and international human rights law and considers how these legal regimes may operate in a complementary manner to address climate-related harm to the marine environment.

4. CONVERGENCE OF THE LAW OF THE SEA AND HUMAN RIGHTS LAW

The challenges posed to the marine environment by climate change clearly highlight the need for an integrated legal approach that combines the law of the sea and human rights law. UNCLOS primarily governs the responsibilities of states to protect and preserve the marine environment, while human rights law focuses on the protection of individuals and communities affected by environmental damages. Recognizing the complementary nature of these frameworks provides a more holistic approach to climate-induced marine harm.

One vital area of the union of these two legal systems is the principle of prevention. Both frameworks require states to take measures to avoid harm. UNCLOS imposes duties to prevent pollution and environmental degradation (United Nations, 1982), while human rights law obliges states to protect individuals from foreseeable threats to life, health, and livelihoods. In the context of climate change, these preventive measures may include reducing greenhouse gas emissions, strengthening coastal defenses, and implementing sustainable fisheries management. This two pronged approach ensures that state obligations address both environmental protection and human welfare as well.

The issue of extraterritorial obligations outside the territory also clearly highlights the possible combination of these two legal frameworks. Climate-related marine harm is often transboundary, affecting areas and populations beyond a single state's jurisdiction. UNCLOS forces the states not to cause any harm or any damage beyond the national boundaries (United Nations, 1982), at the same time, the human rights law is gradually recognizing the state's external responsibility in respecting and protecting human rights abroad. Together, these obligations reinforce accountability for cross-border environmental impacts and create legal incentives for cooperative action.

Legal enforcement and remedies are also another important area of legalization of these two legal structures. As discussed in the previous sections, the Law of the Sea faces certain limitations in determining liability and compensation in case of climate change damage. Human rights laws in this case can play a complementary role, as it provides an alternative way to ensure accountability. These include filing complaints with regional and international human rights organizations and advisory opinions regarding state responsibilities. By integrating these views, the responsibility of the state can be determined simultaneously from the point of view of environmental protection and the protection of affected people.

The convergence of these frameworks also contributes to norm development. Environmental obligations under UNCLOS are primarily procedural and technical, whereas human rights law emphasizes substantive outcomes for individuals and communities.

The combination of these two systems encourages the development of legal standards that reflect both the ecological integrity on the one hand and the protection of human rights on the other. This further strengthens the international legal response to climate change. Advisory opinions, scholarly interpretations, and emerging jurisprudence illustrate how these regimes can influence each other to produce more effective legal solutions (Malaihollo, 2021). Despite the potential for integration, challenges remain. Differences in areas, methods of application and conceptual basis can lead to conflict between these two systems. For example, UNCLOS is mainly state-centered and territorial, while human rights law emphasizes individual protection and external responsibilities. Combining these different views requires careful explanation and creative legal reasoning. Yet, this union of the maritime law and human rights law shows a promising way to deal with complex and borderline environmental problems, which cannot be properly addressed through a single legal system. In conclusion, the intersection of the law of the sea and human rights law provides a complementary legal framework for addressing climate-related marine harm. By combining the procedural, cooperative, and environmental focus of UNCLOS with the substantive, human-centered obligations of international human rights law, states can be guided toward more comprehensive and effective responses. The following section examines the challenges and future directions for implementing these integrated obligations in practice.

5. CHALLENGES AND FUTURE DIRECTIONS

Although the interaction between the law of the sea and human rights law provides a possible effective framework for responding to climate-related harm to the marine environment, some unresolved challenges exist. These challenges operate at legal, institutional, and practical levels, reflecting the inherent difficulty of regulating a phenomenon that is global, cumulative, and transboundary in nature.

Legal and Doctrinal Challenges

A primary legal challenge concerns the attribution of harm.

The damages to the marine environment caused by climate change are the combined result of greenhouse gas emissions from many countries over a long period of time, making it difficult to attribute it to any particular state. Similarly, establishing causation is complicated by the long-term and diffuse nature of climate change impacts. Although emerging jurisprudence and advisory opinions have started to recognize probabilistic causation, legal uncertainty persists regarding how responsibility should be assessed (Paddeu & Jackson, 2025). The fragmentation of international law also creates important theoretical complications. The United Nations Convention on the Law of the Sea (UNCLOS) primarily regulates the responsibility of states to protect and preserve the marine environment, while international human rights law focuses on protecting individuals and communities from harm. Reconciling these two different legal systems- each with its own scope, principles, and mechanisms of application, is not easy. This requires creative interpretation and careful coordination between state-centered and human-centered perspectives. In the absence of a coherent and integrated framework, states risk taking advantage of regulatory gaps or institutional fragmentation to evade real accountability.

Institutional and Enforcement Challenges

Enforcement mechanisms under both legal regimes remain limited. The law of the sea largely depends on voluntary state compliance, reporting obligations, and, where disputes arise, recourse to judicial bodies such as the International Tribunal for the Law of the Sea (ITLOS). Similarly, human rights law offers mechanisms for monitoring and advisory opinions but is constrained in its capacity to compel remedial action (Baderin & Ssenyonjo, 2010). In practice, this creates a gap between formal legal duties and their real-world enforcement, especially in situations involving major emitting states or widespread harm that crosses multiple jurisdictions.

Practical and Political Challenges

Political dynamics further hinder the effective implementation of integrated obligations. States often hesitate to accept legally binding responsibility for climate-related harm to the marine environment because of economic interests, strategic considerations, and domestic political pressures.

Disparities between developed and developing countries, particularly in terms of historical emissions and adaptive capacity, create equity concerns that complicate both cooperation and enforcement (Hall & Persson, 2018). In addition, ongoing scientific uncertainty and the evolving nature of climate data make it difficult to determine the content of “reasonable” preventive action under the due diligence standard, leaving states with considerable discretion and contributing to uneven levels of compliance.

Future Directions

Despite these challenges, several ways exist to strengthen the legal response to climate-related marine harm. Soft law tools, such as guidelines and principles, can help clarify existing obligations and encourage state compliance without requiring immediate treaty changes. Strategic litigation and advisory proceedings can further define legal duties and support the gradual development of legal norms. Stronger international cooperation through data sharing, joint research, and coordinated policy efforts can also help states meet their preventive and adaptive obligations. Combining environmental protection with human rights considerations promotes a more complete approach to ocean governance, strengthens the moral weight of international obligations, and supports innovative remedies such as compensation schemes and climate adaptation assistance. While current frameworks remain imperfect, the convergence of the law of the sea and human rights law offers a foundation for more effective and equitable responses. Future developments in law, jurisprudence, and cooperative action will be critical in ensuring that states are held accountable for protecting both the marine environment and the human populations that depend upon it.

CONCLUSION

Climate change presents profound challenges to the governance and protection of the world’s oceans. Its impacts, including rising sea levels, ocean acidification, and disruption of marine ecosystems, affect both the environment and human populations, particularly those in coastal and island regions.

This chapter has examined the relationship between climate-related harm to the marine environment, state responsibility under the law of the sea, and international human rights law, highlighting both the possibilities and the limitations of existing legal frameworks in responding to these challenges. The law of the sea, as established under UNCLOS, provides important obligations for states to protect and preserve the marine environment.

Articles 192 and 194 impose general and specific duties to prevent, reduce, and control marine pollution, while the principle of due diligence requires states to adopt reasonable measures to avoid harm. Nevertheless, the diffuse and cumulative nature of climate-related marine harm complicates the application of these obligations, particularly in relation to attribution, causation, and the provision of remedies. Human rights law supports the law of the sea by focusing on the protection of people and communities who are harmed by environmental damage. Climate change threatens basic rights such as the right to life, health, food, and a decent standard of living. It also recognizes that states may have responsibilities beyond their own borders when their actions affect people in other countries. Integrating these frameworks enhances accountability by linking environmental protection with the human consequences of legal obligations, thereby addressing gaps left by state-centric environmental law.

The convergence of the law of the sea and human rights law offers a pathway for more comprehensive and effective governance. By combining procedural and cooperative duties with substantive human-centered obligations, states are encouraged to adopt preventive measures, engage in international cooperation, and consider innovative approaches to remedies and adaptation. However, challenges remain, including legal uncertainty, enforcement limitations, political resistance, and equity concerns between states with differing responsibilities and capacities.

Looking forward, the use of soft law tools, advisory opinions, and strategic court cases can help make states' duties clearer and improve compliance. Better integration of environmental protection and human rights can also help develop legal norms that support both environmental sustainability and human well-being.

In the end, dealing with climate-related harm to the marine environment requires a multi-layered approach that recognizes the close link between environmental and human interests and encourages states to work together to protect the oceans and the people who depend on them.

In conclusion, this chapter underscores the need for an integrated legal framework in which the law of the sea and human rights law mutually reinforce each other. By recognizing the interdependence of ecological and human dimensions, international law can better respond to the complex, transboundary, and long-term challenges posed by climate change, ensuring that both the marine environment and human populations are protected.

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