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The Complexity of Environmental Law: Interfaces between Complex Thinking, Scientific Revolutions, and Legal Multidisciplinarity

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Summary

This article analyzes Environmental Law as a third-generation right, articulating it with the concepts of complex thought, by Edgar Morin, and scientific revolutions, by Thomas Kuhn. The environmental legal perspective is approached here as a multidisciplinary field, requiring a transdisciplinary theoretical and practical approach due to its intrinsic complexity and interdependence with various areas of knowledge. In this context, it explores how complex thought contributes to the understanding of systemic relationships in Environmental Law and how the theory of scientific revolutions helps to analyze paradigmatic changes in the legal field. Complementarily, the article addresses the constitutional principles and norms that underpin the application and interpretation of Environmental Law in Brazil. Through this analysis, it seeks to highlight the importance of integrated paradigms for overcoming contemporary environmental challenges.

Keywords: Environmental Law; Complex Thinking; Scientific Revolutions; Environmental Principles; Multidisciplinarity.

Abstract

This paper analyzes Environmental Law as a third-generation right, linking it with Edgar Morin's concept of complex thinking and Thomas Kuhn's scientific revolutions theory. Environmental Law is discussed here as a multidisciplinary field that requires a theoretical and practical transdisciplinary approach due to its intrinsic complexity and interdependence with various fields of knowledge. In this context, the study explores how complex thinking contributes to understanding systemic relations in Environmental Law and how the theory of scientific revolutions helps analyze paradigm shifts in the legal domain. Additionally, the paper addresses the constitutional principles and norms that underpin the application and interpretation of Environmental Law in Brazil. Through this analysis, it seeks to highlight the importance of integrated paradigms to overcome contemporary environmental challenges.

Keywords: Environmental Law; Complex Thinking; Scientific Revolutions; Environmental Principles; Multidisciplinarity.

1. Introduction

Environmental Law is an area of law that emerged in the context of the 20th century, characterized by its response to global demands for environmental protection. Unlike others legal branches, which are traditionally structured around bilateral and property-related relationships, the Environmental Law presents itself as a collective and transgenerational right, aimed at guaranteeing for ecological balance and the quality of life of future generations.

The emergence of this branch of law was accompanied by a growing awareness of The international community is concerned about the impacts of human activities on the environment. A milestone. The initial impetus for this awareness was the United Nations Conference on the Human Environment, held in Stockholm in 1972. This conference not only acknowledged environmental degradation, as a global problem, but it also promoted the idea that states have a



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shared responsibility in mitigating environmental damage. The final document of this

The conference established principles that influenced the drafting of national legislation, including

The development of Environmental Law in Brazil.

In the Brazilian context, the 1988 Federal Constitution plays a central role in

Recognition and protection of the environment. Considered a milestone in constitutionalism.

Regarding environmental issues, the Constitution dedicated an entire chapter to the topic, consolidating article 225.

as the central axis of this protection. This article establishes that everyone has a right to the environment.

Ecologically balanced, essential to a healthy quality of life, imposing itself on the Public Authorities and on

The community has a duty to defend and preserve it for present and future generations.

In addition to Article 225, other constitutional provisions reinforce environmental protection in

Brazil. Article 170, item VI, establishes the environment as a fundamental principle of the economic order.

promoting sustainable development. Article 186, item II, provides that the social function of

Rural property ownership is linked to environmental preservation, requiring practices that respect the balance between the environment and the environment.

ecological. Finally, article 231 guarantees indigenous peoples the right to their lands, protecting the

The natural resources found within them are recognized, along with their importance in preserving biodiversity.

In the international arena, environmental treaties and conventions have played a crucial role.

in the advancement of Environmental Law. The Convention on Biological Diversity (CBD), adopted during

The Rio-92 conference is a notable example. This international treaty commits signatory states to...

to protect biodiversity, promote the sustainable use of natural resources and share them

to distribute the benefits derived from the use of these resources fairly and equitably. Brazil's adherence to

The CBD was an important step towards consolidating the country as a leader in environmental protection.

global scenario.

Thus, the introduction to Environmental Law cannot be dissociated from its character.

multidisciplinary and the need to articulate knowledge from different areas to face the

contemporary challenges. This research starts from this premise to explore, in depth,

the interfaces between the complex thought of Edgar Morin and the scientific revolutions of Thomas

Kuhn and the constitutional principles and norms applicable to Environmental Law in Brazil. This

This approach allows us to understand how Environmental Law has evolved to become a tool.

essential in promoting sustainability and environmental justice, while also facing challenges

significant for its practical implementation.

2. Complex Thinking and its Relevance in Environmental Law

2.1. Complex thought according to Edgar Morin



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Edgar Morin¹, presents a forceful critique of the Cartesian and positivist paradigm that fragments knowledge into isolated disciplines. For him, complexity does not mean "complication," but an approach that recognizes the multiple interconnections between elements and systems. The fragmentation of knowledge prevents a comprehensive understanding of phenomena, especially those that, like environmental issues, involve multiple dimensions: ecological, social, economic, political and cultural.

According to Morin, complex thought values "holographic," a concept that expresses that each part of a system contains something of the whole, just as the whole is constituted by its parts. This view breaks with the traditional reductionist approach, which tends to analyze parts isolated without understanding the totality and dynamics of the systems.

Another important concept in Morin's thinking is that of transdisciplinarity, which seeks overcoming barriers between disciplines, promoting a dialogue that recognizes the interdependence between them. In the environmental context, this implies the integration of knowledge originating from the natural, social, and legal sciences.

2.2. Application of complex thinking to Environmental Law

Environmental Law is a legal field that clearly exemplifies the need for a complex approach, as proposed by Morin. Problems such as climate change, The degradation of ecosystems, the pollution of water resources, and the loss of biodiversity are These are interconnected global issues that cannot be understood or resolved in isolation. They They require the interaction of multiple areas of knowledge, disciplines, and practices for an effective approach and Sustainable. This characteristic reflects the core of complex thinking, which seeks to integrate the parts to understand the overall context and recognize the interdependencies between different systems and phenomena.

Article 225 of the 1988 Federal Constitution reflects this integrated vision by imposing on the Executive Branch... It is the public's duty, and the community's responsibility, to protect and preserve the environment for future generations and future ones. This device acknowledges that environmental preservation is not the sole responsibility of the environment from a single sector or entity, but requires the collaboration of various social actors, including governments, businesses, civil society organizations, and individuals. This perspective aligns with complex thinking, understanding that environmental problems are multifaceted and require solutions that consider the interaction between natural, social, and economic systems.

A practical example of applying complex thinking to Environmental Law is... The use of Environmental Impact Assessments (EIAs) as a fundamental legal instrument in Brazil. The EIA, required for projects that may cause significant environmental degradation, is a

¹Introduction to Complex Thought (2005)



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This is a practical manifestation of this approach, as it demands the integrated analysis of multiple aspects.

including ecological, economic, social, and cultural impacts. This comprehensive analysis is essential.

to assess the consequences of a project before its implementation and propose measures

mitigating measures. Furthermore, the environmental impact report (EIR), which summarizes the data from the EIA,

It promotes transparency and public participation, essential elements for decision-making.

sustainable and well-founded

Another example is the National Environmental Policy (Law No. 6,938/1981), which adopts a

A systemic approach to predicting the integrated action of various bodies and sectors through the System.

National Environment System (SISNAMA). This system institutionalizes collaboration between

different levels of government and civil society entities in the formulation and execution of policies

environmental practices. The law also introduces economic instruments, such as tax incentives for environmental practices.

sustainable, demonstrating the interaction between economic and ecological aspects.

The application of complex thinking is especially evident in combating

Deforestation in the Amazon is one of Brazil's most significant environmental challenges. This issue

It involves the interaction of science, technology, public policy, and law. Satellite monitoring,

For example, it uses advanced technology to identify areas of illegal deforestation in real time.

Real. This scientific data is integrated into oversight actions carried out by agencies such as the

IBAMA, which applies legal sanctions against offenders. At the same time, public policies such as

The Amazon Fund seeks to finance conservation and sustainable development projects.

highlighting a holistic approach to dealing with a multifaceted problem.

3. Scientific Revolutions and the Evolution of Environmental Law

3.1. The Structure of Scientific Revolutions by Thomas Kuhn

Thomas Kuhn² proposes that scientific progress occurs through disruptions.

paradigmatic, rather than a linear and cumulative evolution. According to him, a paradigm is the

a set of values, theories, and methods shared by a scientific community in

at a given moment. Scientific revolutions occur when a prevailing paradigm becomes...

Unable to solve new problems, and therefore replaced by someone else.

In the legal field, this theory helps to understand how Environmental Law emerged as

a new paradigm, breaking with the traditional view that prioritized economic growth in

to the detriment of environmental preservation. The paradigmatic revolution in Environmental Law was

driven by scientific advances, such as studies on the limits of growth and ecology

global studies have highlighted the negative impacts of human activities on the environment.

² The Structure of Scientific Revolutions (2003)

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3.2. The relationship between science and Environmental Law

Environmental Law is a field deeply interconnected with discoveries and advancements.

Scientific principles. Science provides the empirical and technical basis that guides the formulation of legal norms.

public policies and environmental management instruments, allowing the law to keep pace with

The complexity of contemporary environmental challenges. This relationship is essential for dealing with

issues such as climate change, deforestation, pollution and loss of biodiversity, which

They require solutions based on evidence and reliable data.

A significant example of this connection is the role played by the Panel's reports.

Intergovernmental Panel on Climate Change (IPCC), which synthesizes scientific knowledge.

global news about global warming and its impacts. These reports have directly influenced...

The creation of climate policies and international treaties, such as the Paris Agreement of 2015. This

This legal instrument establishes global targets for reducing greenhouse gas emissions.

based on scientific data indicating the need to limit the increase in average temperature

Globally, temperatures are 1.5°C above pre-industrial levels. Science, in this context, not only provides...

It provides evidence about the severity of the climate crisis, but also guides the actions needed to mitigate it.

there.

In Brazil, the relationship between science and environmental law is particularly evident in...

The formulation of important regulations, such as the Forest Code (Law No. 12.651/2012). This legislation,

which regulates the use and protection of native vegetation on rural properties, was developed based on

scientific studies on the importance of permanent preservation areas (APPs) and reserves

legal for maintaining biodiversity, protecting water resources, and ensuring climate balance.

Science has provided fundamental data to justify the requirement for strips of native vegetation to

Along rivers and slopes, they act as barriers against erosion, flooding, and loss of fertile soil.

Another example is the National Water Resources Policy Law (Law No. 9,433/1997), which

It is based on hydrological and ecological studies to establish guidelines for management.

Sustainable water resources. Science has demonstrated, for example, the interdependence between ecosystems.

aquatic and terrestrial, in addition to the need to guarantee the availability of water of good quality and

adequate quantities for future generations. This legislation also reflects technological advancements in

monitoring and managing river basins, promoting the rational and integrated use of resources.

water resources.

The application of science to Environmental Law in Brazil is also observed in policies.

public initiatives aimed at combating deforestation. The Deforestation Detection System in

Real-Time Data Interchange (DETER), developed by the National Institute for Space Research (INPE), uses

Satellite imagery is used to monitor the loss of native vegetation in real time, enabling action.

rapid inspection procedures. This scientific data supports legal and administrative actions against



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illegal deforestation and guide strategies for the protection of the Amazon Rainforest, which

It plays a crucial role in global climate regulation.

3.3. Environmental Law as a Paradigmatic Shift

The emergence of Environmental Law in Brazil represents a true rupture.

paradigmatic in relation to traditional legal approaches, historically focused on

Protection of private property and encouragement of unrestricted economic development. This

The disruption was driven by global changes in the understanding of the impacts of activities.

Humans' impact on the environment, culminating in the creation of norms and principles that recognize the

The interdependence between natural systems, society, and the economy. This transformation was

largely influenced by global events, such as the Stockholm Conference (1972), which marked

The beginning of a new era in international environmental governance.

The Stockholm Conference introduced the concept of shared responsibility for

environmental problems, establishing that all States and individuals have a duty to contribute.

for the preservation of the environment. Among the principles enshrined in the conference, the following stands out:

understanding that economic development must be conducted in a sustainable manner,

respecting the planet's ecological limits. This global milestone directly influenced the formulation.

of legislation and public policies in various countries, including Brazil.

In the national context, this paradigmatic shift was consolidated with the promulgation of

The 1988 Federal Constitution, which enshrined environmental protection as a fundamental right.

Article 225 of the Constitution establishes that everyone has the right to an ecologically sound environment.

Balanced, essential to quality of life, and imposes on the State and the community the duty to defend it.

and preserve it for present and future generations. This device represents a change of

paradigm in treating the environment as a legal asset of collective and transgenerational interest,

going beyond the restrictive view of environmental protection as a mere matter of heritage.

The inclusion of environmental issues in the 1988 Constitution also reflected the influence of

social and environmental movements that emerged in Brazil in the 1970s and 1980s,

driven by advances in science and global debates on sustainable development. These

Movements pushed for a change in how the country approached environmental issues.

resulting in the incorporation of principles such as precaution, prevention and the polluter-pays principle into

legislation and public policies.

This paradigm shift is also evident in the creation of legal instruments, already

mentioned, such as the National Environmental Policy (Law No. 6,938/1981), which established the

The National Environmental System (SISNAMA) and environmental licensing. These instruments

They institutionalized concern about the environmental impacts of economic activities and



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They established mechanisms to ensure that decision-making processes take the limits into account.

Ecological and collective interests.

Furthermore, international treaties to which Brazil is a signatory reinforce this rupture. paradigmatic in Environmental Law. Documents such as the Convention on Biological Diversity (CBD), the United Nations Framework Convention on Climate Change (UNFCCC) and the Agreement The decisions from Paris reinforce the perspective that environmental protection is a global responsibility. requiring coordinated actions between countries. These treaties, while guiding policies Brazilian environmental laws reflect the advancement of a legal paradigm that recognizes interdependence. between the local and the global, the present and the future.

In theory, this paradigmatic transformation has also been analyzed by scholars. like Edis Milare³ which highlights that Environmental Law inaugurates a new phase in the history of Law, breaking with the traditional model and introducing principles and norms aimed at... protection of diffuse and transindividual goods. Milaré argues that this change reflects not only a legal evolution, but also an ethical transformation, that recognizes the environment as essential for human dignity and for the survival of the planet.

José Eli da Veiga⁴ reinforces that the consolidation of Environmental Law as a new This legal paradigm is a result of growing global awareness of the limits to growth. economic and the risks associated with environmental degradation. For him, Environmental Law is a field dynamic and multidisciplinary, requiring constant dialogue with science and politics to address The challenges of a world in transformation.

4. Constitutional Principles and Norms Applicable to Environmental Law

4.1. Fundamental Principles of Environmental Law

Principles are fundamental to the interpretation and application of Environmental Law. serving as guidelines that guide the creation of standards, the formulation of public policies and the judicial decision. In Brazil, environmental principles are widely recognized both in the text constitutional as well as in sub-constitutional legislation, such as Law No. 6,938/1981 (Policy National Environment Ministry).

4.1.1. Prevention Principle

The precautionary principle is one of the fundamental pillars of Environmental Law and establishes that measures should be taken in advance to prevent damage to the environment. This principle reflects the idea that prevention is more effective, sustainable, and economically viable than...

³ Environmental Law (11th ed., pp. 41-43)

⁴ Sustainability: Legitimizing a New Value (4th ed., pp. 25-27)

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to remedy the negative impacts already caused. It is directly related to responsibility.

The State and the community have the power to act preventively, as provided for in article 225 of The 1988 Federal Constitution, which imposes the duty of environmental preservation for present and future generations. generations.

This principle is widely applied in various legal instruments in Brazil, being the Environmental licensing is one of the most important processes. Licensing is regulated by Law No. 6.938/1981 (National Environmental Policy) and by resolutions of the National Environmental Council Environment (CONAMA) requires a prior analysis of potential environmental impacts before installation. of projects that may cause degradation. This is a technical and legal procedure. which integrates ecological, social and economic aspects in decision-making, reflecting the need to anticipate and mitigate risks before irreversible damage occurs.

Environmentalist doctrine frequently highlights the importance of the precautionary principle. as an essential mechanism for achieving sustainable development. Paulo de Bessa Antunes⁵ He argues that prevention is intrinsic to the concept of sustainability, as it seeks to avoid impacts that could compromise environmental integrity and the quality of life of populations. He It also emphasizes that prevention is not only a duty of the Public Authorities, but of all agents. of society, including individuals, businesses, and non-governmental organizations. José Afonso da Silva⁶ highlights that the principle of prevention is of paramount importance in societies in development, like in Brazil, where economic pressures frequently come into conflict. with the need for environmental preservation. For him, prevention should be seen as an element strategic, which not only protects the environment but also promotes economic stability. and long-term social impact.

Therefore, the principle of prevention, by promoting proactive and well-founded actions, does not It not only protects the environment, but also prevents socioeconomic conflicts and ensures... Sustainability of human activities. Its practical application, based on sound doctrines and Supported by judicial decisions, this highlights the relevance of this principle as an instrument. indispensable for building a sustainable and environmentally balanced future.

4.1.2. Precautionary Principle

The **precautionary principle** is one of the most important pillars of Environmental Law. contemporary, focused on risk management in situations of scientific uncertainty. It establishes that, even in the absence of definitive scientific proof, preventive measures should be taken.

⁵ Environmental Law (13th ed., p. 33)

⁶ Constitutional Environmental Law (10th ed., p. 66)



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Adopted to prevent serious or irreversible environmental damage. The principle originates in Law.

International, enshrined in the Rio Declaration of 1992, and finds implicit support in article

Article 225 of the 1988 Federal Constitution, which reinforces the need for environmental protection for the present and future generations.

In Brazil, the precautionary principle is frequently applied in situations involving new technologies or activities whose environmental impacts are not yet fully understood. Unlike the prevention principle, which operates based on the identification of known risks, Precaution guides decision-making in uncertain scenarios, seeking to avoid negative consequences. potentially catastrophic. This approach reflects the need for responsible management and prudent in the face of the limitations of human knowledge, especially in relation to issues complex environmental factors, such as climate change, the use of genetically modified organisms Modified organisms (GMOs) and the release of chemicals into the environment.

Paulo de Bessa Antunes⁷ highlights that the precautionary principle is essential for the realization of sustainable development, since it allows the adoption of restrictive measures. even when science doesn't yet offer definitive answers. He argues that precaution should be taken. to be understood as an ethical duty of protection, which transcends the limits of scientific certainty and prioritizes environmental safety and quality of life. José Afonso da Silva⁸ reinforces that the principle The precautionary principle is an indispensable tool for environmental management in times of rapid change. technological and ecological. For him, precaution does not impede economic or technological progress. but it requires that this progress be conducted responsibly, respecting the limits of carrying capacity of ecosystems.

A practical example of the application of the precautionary principle in Brazil is the regulation of the use of... of pesticides. Brazilian environmental legislation requires that these products undergo testing. rigorous testing and analysis before being released for commercial use, even if their effects of The long-term consequences are not yet fully known. This precautionary approach aims to minimize the risks to human health and the environment, ensuring that potentially hazardous substances They should not be widely used before being properly evaluated.

Therefore, the precautionary principle plays a vital role in Environmental Law. Brazilian, guiding responsible decision-making in uncertain scenarios and promoting the Environmental protection in a prudent and proactive manner. Its practical application, grounded in doctrines. and supported by court decisions, demonstrates its relevance as an essential instrument for To address the environmental challenges of the 21st century, ensuring sustainability and ecological balance.

⁷ Environmental Law (13th ed., p. 36)

⁸ Constitutional Environmental Law (10th ed., p. 68)

4.1.3. Polluter Pays Principle

The **polluter-pays principle** is one of the most significant principles of law.

Contemporary environmental law establishes that those responsible for environmental degradation must bear the consequences with the costs of its prevention, mitigation, or repair. This principle reflects the commitment to environmental justice, ensuring that the costs arising from polluting activities are not borne by others. transferred to the community or to the Public Authority. It is based on provisions constitutional and sub-constitutional laws in Brazil, as highlighted in article 225 of the Constitution. Federal Constitution of 1988 and in the National Environmental Policy (Law No. 6,938/1981), which enshrines the strict liability for environmental damage.

Unlike other principles, such as prevention or precaution, the polluter- The payer operates after the damage has occurred or when a specific, identified impact exists. ensuring that the economic and legal burden falls on whoever caused the degradation. This is about an essential principle for internalizing environmental costs in economic activities, promoting Greater responsibility for companies and individuals towards the environment.

Édis Milaré⁹ points out that the polluter-pays principle should not be interpreted as a license to pollute, but as a mechanism for accountability. He argues that, by By imposing on the polluter the obligation to repair the damage caused, this principle not only ensures the environmental justice, but it also encourages more sustainable practices by making externalities... Environmental factors are an economic consideration for companies.

Celso Antonio Pacheco Fiorillo¹⁰ reinforces that the polluter-pays principle is essential. for the realization of sustainable development. He notes that, by assigning responsibility economically, the principle promotes a balance between pollutants and economic development. and environmental preservation, ensuring that the costs of degradation are internalized by Productive activities, instead of impacting the environment or society as a whole.

In Brazil, the polluter-pays principle is widely applied in disaster cases. environmental. A prime example is the case of the collapse of the Fundão dam in Mariana. (MG), in 2015, considered one of the biggest environmental disasters in the country's history. In this case, the The companies responsible, Samarco, Vale, and BHP Billiton, were ordered to pay compensation. billions of dollars to finance the environmental recovery of the affected region. The application of the principle of

⁹ Environmental Law (11th ed., pp. 99-101)

¹⁰ Course on Brazilian Environmental Law (21st ed., pp. 151-153)



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The polluter-pays principle in this case was reaffirmed in several court decisions, which determined that the repair costs should be fully borne by the companies responsible, regardless of proof of guilt, based on strict liability.

Therefore, the polluter-pays principle plays a crucial role in law.

Environmental, ensuring that the costs arising from degradation are borne by those who... caused. Based on solid doctrine and supported by judicial decisions, the principle not only It promotes environmental justice, but also encourages more responsible and sustainable practices. contributing to environmental protection and balanced development. Its application is indispensable for dealing with contemporary environmental challenges and ensuring that damage to The environment should not be neglected or transferred to society as a whole.

4.1.4. Principle of Intergenerational Solidarity

The principle of intergenerational solidarity is one of the most significant in the context of Environmental Law, reflecting the concern for the preservation of the environment not only for the present generations, but also future ones. This principle is enshrined in article 225 of the The 1988 Federal Constitution, which imposes on the Public Authorities and the community the duty to protect the The environment is essential to guarantee a decent quality of life for future generations. He also... This connects directly to the goals of sustainable development, which seeks to balance the economic, social, and environmental needs in such a way that natural resources are used without compromising its future availability.

Intergenerational solidarity transcends mere environmental responsibility. It... It is based on an ethic of caring for the future, requiring the current generation to act in a way that... responsible for preventing natural resources from being depleted or ecosystems from being destroyed. degraded to the point of jeopardizing the life or well-being of future generations.

According to Celso Antonio Pacheco Fiorillo¹¹ the principle of intergenerational solidarity is one of the most important foundations of Environmental Law, as it outlines legal and ethical obligations Beyond the present. He argues that this principle is an extension of dignity itself. Human rights, which are not limited to the current generation, but encompass the rights of those yet to be born. Fiorillo points out that the Brazilian Constitution incorporates this perspective by recognizing the environment. An ecologically balanced environment as an essential right for a healthy quality of life.

Maria Sylvia Zanella di Pietro¹² also emphasizes the importance of solidarity. Intergenerational as a structuring concept in Environmental Law. For the author, the principle is not

¹¹ Principles of Environmental Law (8th ed., pp. 63-65)

¹² Brazilian Environmental Law (2nd ed., pp. 104-106)



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not only a legal imperative, but a moral obligation that the present generation must assume to with the future. She states that intergenerational solidarity serves as the foundation for policies public initiatives that seek to preserve scarce natural resources, guarantee biodiversity, and combat environmental damage. Climate change is an issue with long-term implications.

A practical example of the application of this principle in Brazil can be found in conservation policies of the Amazon Rainforest. Continuous monitoring and enforcement efforts by agencies such as IBAMA and ICMBio aim not only to protect biodiversity and ecosystem services, but also also to ensure that future generations have access to a healthy environment. Initiatives such as The soy moratorium, which seeks to prevent the expansion of cultivation in deforested areas, exemplifies this. How can the principle of intergenerational solidarity guide concrete preservation measures? environmental.

Furthermore, the principle is widely used to justify actions to protect... Indigenous territories, as is the case with the Yanomami Indigenous Territory. The protection of these territories It is not limited to guaranteeing the rights of current indigenous populations, but also seeks to preserve them. environmental integrity for their descendants and for all of humanity, which depends on these services. ecosystems provided by these areas.

Therefore, the principle of intergenerational solidarity plays an essential role in Environmental Law, guiding decision-making with a long-term vision and promoting... The ethical and legal responsibility of the current generation towards the future.

4.2. Constitutional Norms Relating to the Environment

The 1988 Federal Constitution is considered one of the most advanced in the world in relation to... to environmental protection. Article 225 is the central point of this recognition, but other provisions Constitutional provisions complement environmental protection:

- **Article 170, item VI:** Includes environmental protection as a principle of the economic order, establishing a balance between economic development and ecological preservation.
- **Article 186, item II:** Determines that the social function of rural property is linked to environmental preservation and the sustainable use of natural resources.
- **Article 231:** Recognizes the territorial rights of indigenous peoples and the importance of their lands. for the preservation of biodiversity and natural resources.

5. Conclusion and Future Perspectives

Brazilian Environmental Law is a clear expression of how the legal system can to evolve in order to respond to global sustainability challenges. The analysis carried out throughout this



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This article attempted to demonstrate how Edgar Morin's complex thought and the theory of revolutions...

Thomas Kuhn's scientific theories offer fundamental theoretical tools for understanding the

The dynamic and multidisciplinary nature of Environmental Law.

5.1. The challenges of practical implementation

Although Brazil has one of the most advanced environmental laws in the world,

The effectiveness of these standards faces significant challenges. Among them, the lack of resources stands out.

for environmental oversight, the resistance of economic sectors to paradigm shifts and the

The absence of a consolidated environmental culture in Brazilian society.

For example, the increasing rates of deforestation in the Amazon reveal the difficulty of

Implement effective public policies to curb environmental degradation. Furthermore, conflicts

Interactions between different sectors of government and economic interests often result in setbacks.

in environmental legislation.

5.2. Proposals for strengthening Environmental Law

Given these challenges, some measures can be proposed to strengthen the law.

Environment in Brazil:

- 1. Environmental education:** Investing in environmental awareness and education programs is essential. to promote a culture of sustainability.
- 2. Institutional strengthening:** Guaranteeing adequate resources for environmental agencies such as the IBAMA is fundamental for the oversight and enforcement of environmental regulations.
- 3. Adoption of sustainable technologies:** Promoting technological innovation to reduce impacts. Environmental protection is a strategic path to align economic development and preservation. environmental.
- 4. International commitments:** Brazil should strengthen its participation in global treaties, such as the Paris Agreement, and meet ambitious environmental targets.

5.3. Final Reflections

The future of Environmental Law depends on an integrated and collaborative approach that

Articulate science, law, and society. The commitment to constitutional principles and the adoption of

Complex thinking is a fundamental element in facing environmental challenges.

21st century and building a sustainable future.

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