



## FROM FLORA AND FAUNA TO SUSTAINABLE DEVELOPMENT: CONCEPTUALIZING BIODIVERSITY IN ENVIRONMENTAL LAW

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**ABSTRACT:** *This article examines the intricate relationship between biodiversity conservation and environmental law, exploring how various legal frameworks conceptualize and protect biodiversity. It delves into theoretical perspectives such as Natural Law, Positive Law, Legal Realism, Sociological Theory, and Historical Legal Theory, providing a comprehensive understanding of the ethical, statutory, practical, societal, and historical dimensions of biodiversity laws. The article also discusses key conceptual frameworks, including biodiversity conservation strategies, the integration of biodiversity goals into sustainable development, and the role of Environmental Impact Assessments (EIA) in protecting biodiversity. Through case studies, the article highlights the successful implementation of biodiversity laws in countries like Costa Rica and Namibia, emphasizing the importance of community involvement and adaptive management practices. Finally, the article addresses the challenges and opportunities in improving legal frameworks for biodiversity protection, advocating for greater international cooperation and the development of innovative legal and policy approaches. The findings underscore the necessity of integrating biodiversity considerations into environmental law as a critical component of global sustainability efforts, offering recommendations for future research and policy development.*

**KEYWORDS:** Biodiversity Conservation, Environmental Law, Theoretical Perspectives, Sustainable Development.



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## INTRODUCTION

Biodiversity, encompassing genetic, species, and ecosystem diversity, is fundamental to maintaining ecological balance and ensuring the resilience of natural systems. It provides essential ecosystem services such as pollination, water purification, and climate regulation, which are crucial for human well-being and sustainable development. According to the Millennium Ecosystem Assessment,<sup>1</sup> biodiversity supports ecosystem functioning and productivity, which in turn underpins human survival and quality of life. The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) highlights that the loss of biodiversity due to human activities, such as habitat destruction and pollution, threatens these services and can lead to significant ecological and economic consequences.<sup>2</sup>

The purpose of this article is to examine how environmental law conceptualizes biodiversity and integrates it into sustainable development frameworks. By analyzing various legal theories and conceptual frameworks, the article aims to elucidate how legal instruments and policies address biodiversity conservation and promote sustainable practices. The focus will be on understanding how legal frameworks, including international agreements and national regulations, contribute to the protection of biodiversity and the achievement of sustainable development goals (SDGs). This analysis will provide insights into the effectiveness of current legal approaches and identify areas for improvement in the integration of biodiversity considerations into environmental law.

The article is structured to provide a comprehensive review of the conceptual and theoretical perspectives on biodiversity within environmental law. It begins with an exploration of the theoretical frameworks, including Natural Law, Positive Law, Legal Realism, Sociological Theory, and Historical Legal Theory, to understand their impact on biodiversity protection. Following this, the article discusses various conceptual frameworks for biodiversity conservation, such as protected areas, species recovery programs, and the role of Environmental Impact Assessments (EIA). The discussion will then integrate these frameworks into a broader analysis of policy and legal structures, highlighting challenges and opportunities for improving biodiversity protection. The article concludes with a summary of findings and recommendations for future research and policy development to enhance the integration of biodiversity into environmental law.

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<sup>1</sup> Reid, W. V., Mooney, H. A., Cropper, A., Capistrano, D., The David and Lucile Packard Foundation, & Stanford University, (*Ecosystems and human well-being: Synthesis*. Island Press. 2005).

<sup>2</sup> Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). (2019). *Global Assessment Report on Biodiversity and Ecosystem Services*. IPBES.



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## CONCEPTUALIZING BIODIVERSITY

Biodiversity, or biological diversity, is a term that encompasses the variety and variability of life forms on Earth, and it is often categorized into three primary levels: genetic diversity, species diversity, and ecosystem diversity. Each of these levels plays a crucial role in maintaining the health and stability of ecosystems.

### i. Genetic Diversity

Genetic diversity refers to the range of genetic variations within a species. This variation is crucial for the adaptability and resilience of species, allowing them to survive environmental changes and pressures. For example, higher genetic diversity within a population can lead to greater resistance to diseases and pests.<sup>3</sup> The conservation of genetic diversity is essential for the long-term survival of species, as it provides the raw material for evolutionary processes and adaptation.<sup>4</sup> Genetic diversity is also critical for breeding programs aimed at restoring endangered species or improving agricultural crops.<sup>5</sup>

### ii. Species Diversity

Species diversity refers to the variety of species within a specific region or ecosystem. It is often measured using indices that account for both the number of species (richness) and their relative abundance (evenness).<sup>6</sup> High species diversity is indicative of a healthy and resilient ecosystem, as it enhances ecosystem functionality and stability. For instance, ecosystems with diverse species can perform a wide range of ecological functions, such as nutrient cycling and pollination, more effectively than those with fewer species.<sup>7</sup> The loss of species diversity can lead to ecosystem degradation and reduced ecosystem services.<sup>8</sup>

### iii. Ecosystem Diversity

Ecosystem diversity encompasses the variety of ecosystems or habitats within a given area, including the complex interactions among species and their environments. This level of biodiversity is crucial for maintaining ecological processes and functions. Diverse ecosystems provide a range of services such as carbon sequestration, water purification, and soil fertility.<sup>9</sup> The variety of ecosystems within a region can also contribute to the overall resilience of the environment, allowing it to withstand and recover from disturbances such as climate change or

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<sup>3</sup> Frankham, R. (2005). Genetics and extinction. *Biological Conservation*, 126(2), 131-140.

<sup>4</sup> Magurran, A. E. (2004). *Measuring biological diversity*. Blackwell Publishing.

<sup>5</sup> Hedrick, P. W. (2001). Conservation genetics: Where are we now? *Trends in Ecology & Evolution*, 16(11), 629-636.

<sup>6</sup> Magurran, A. E. (2004). *Measuring biological diversity*. Blackwell Publishing.

<sup>7</sup> Cardinale, B. J., Duffy, J. E., Gonzalez, A., Hooper, D. U., Perrings, C., Venail, P., & Narwani, A. (2012). Biodiversity loss and its impact on humanity. *Nature*, 486(7401), 59-67.

<sup>8</sup> Sala, O. E., et al. (2000). Global biodiversity scenarios for the year 2100. *Science*, 287(5459), 1770-1774.

<sup>9</sup> TEEB. (2010). *The Economics of Ecosystems and Biodiversity Ecological and Economic Foundations*. Pushpam Kumar (Ed.). Earthscan.



natural disasters.<sup>10</sup> Protecting ecosystem diversity is essential for sustaining the natural processes that support life on Earth.

### **Importance of Biodiversity for Ecological Balance**

Biodiversity plays a critical role in maintaining ecological balance by providing a range of ecosystem services essential for the stability and functionality of natural systems. Ecosystem services are the benefits that humans derive from natural ecosystems, including provisioning services such as food, water, and raw materials; regulating services such as climate regulation and disease control; supporting services like nutrient cycling and soil formation; and cultural services including recreational and aesthetic values.<sup>11</sup> For instance, diverse plant species contribute to soil fertility and prevent erosion through root systems that stabilize the soil and enhance its structure.<sup>12</sup> Similarly, a variety of pollinators, including bees, butterflies, and birds, are crucial for the reproduction of many plants and crops, supporting agricultural productivity and food security.<sup>13</sup> The intricate interactions among different species within ecosystems ensure that these services are delivered effectively, highlighting the importance of preserving biodiversity to sustain these vital benefits.

In addition to providing ecosystem services, biodiversity enhances the resilience of ecosystems to environmental changes and disturbances. Resilience refers to the capacity of an ecosystem to absorb shocks and recover from disruptions while maintaining its essential functions and processes.<sup>14</sup> Diverse ecosystems are more likely to withstand and recover from environmental stresses such as climate change, pollution, and habitat destruction, due to the presence of a variety of species and ecological processes that can buffer against changes.<sup>15</sup> For example, coral reef ecosystems with high species diversity are better able to recover from bleaching events compared to less diverse reefs, as different species may have varying tolerances to temperature changes and can contribute to the overall resilience of the system.<sup>16</sup> By maintaining high levels of biodiversity, we enhance the ability of ecosystems to adapt and persist in the face of environmental challenges, thereby safeguarding their long-term health and functionality.

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<sup>10</sup> Folke, C., Carpenter, S. R., Elmqvist, T., Gunderson, L., Holling, C. S., & Walker, B. (2004). Regime shifts, resilience, and biodiversity in ecosystem management. *Annual Review of Ecology, Evolution, and Systematics*, 35, 557-581

<sup>11</sup> TEEB. (2010). *The Economics of Ecosystems and Biodiversity Ecological and Economic Foundations*. Pushpam Kumar (Ed.). Earthscan.

<sup>12</sup> *Ibid.*

<sup>13</sup> Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 4, 1-23.

<sup>14</sup> Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual Review of Ecology and Systematics*, 4, 1-23.

<sup>15</sup> Elmqvist, T., et al. (2003). Response diversity, ecosystem change, and resilience. *Frontiers in Ecology and the Environment*, 1(9), 488-494.

<sup>16</sup> Wilson, E. O. (1992). *The Diversity of Life*. Belknap Press. Portland



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## Theoretical Perspectives on Biodiversity in Environmental Law

### i. Natural Law Theory

Natural Law Theory posits that the protection of biodiversity is rooted in ethical and moral imperatives that arise from the intrinsic value of nature and the inherent rights of all living beings. This perspective draws from historical views on natural rights, where early philosophers like John Locke argued for the stewardship of the environment as a duty derived from natural law.<sup>17</sup> The notion that humans have a moral obligation to preserve biodiversity aligns with the idea that nature, as part of the common good, must be protected for the benefit of present and future generations. This theory underpins many environmental movements and policies that emphasize the ethical responsibility of humans to safeguard ecosystems and species. The concept of environmental stewardship, which advocates for the responsible management and care of natural resources, is a direct application of Natural Law Theory in modern environmental ethics (Leopold, 1949).<sup>18</sup>

### ii. Positive Law Theory

Positive Law Theory focuses on the creation and implementation of statutory and regulatory frameworks that provide legal protections for biodiversity. This perspective emphasizes the role of formal laws and regulations, enacted by governmental bodies, to address environmental issues. Key international agreements, such as the Convention on Biological Diversity (CBD) of 1992, and national laws like the Endangered Species Act (ESA) of 1973 in the United States, are examples of legal instruments designed to protect biodiversity through positive law.<sup>19</sup> These frameworks establish the legal basis for conservation efforts, including the protection of habitats, regulation of wildlife trade, and enforcement of penalties for biodiversity-related crimes. Positive Law Theory underscores the importance of codified laws in ensuring that biodiversity protection is not left to voluntary actions but is instead mandated and enforceable through legal channels.<sup>20</sup>

### iii. Legal Realism

Legal Realism offers a pragmatic approach to the application of biodiversity laws, focusing on how these laws are enforced and their effectiveness in practice. This perspective recognizes that the mere existence of laws is insufficient without robust implementation and enforcement mechanisms. Case studies, such as the enforcement of the European Union's Habitats Directive, highlight the challenges and successes in applying biodiversity laws on the ground.<sup>21</sup> Legal Realism emphasizes the need for continuous monitoring, judicial oversight, and adaptive management strategies to ensure that biodiversity laws achieve their intended outcomes. It also considers the influence of political, economic, and social factors on the enforcement of biodiversity

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<sup>17</sup> Locke, J. (1689). *Two Treatises of Government*, London, McMaster University Archive

<sup>18</sup> Leopold, A. (1949). *A Sand County Almanac: And Sketches Here and There*. Oxford University Press.

<sup>19</sup> Convention on Biological Diversity (CBD), 1992. Text of the Convention on Biological Diversity., Endangered Species Act (ESA), 1973. Public Law 93-205.

<sup>20</sup> Doremus, H. 2010 *The Endangered Species Act: Static Law Meets Dynamic World*. Journal of Law and Policy, Washington University in St. Louis School of Law | Privacy Policy Sax, J. L. (1980). *Mountains Without Handrails: Reflections on the National Parks*. University of Michigan Press.

<sup>21</sup> Krämer, L. (2011). *EU Environmental Law*. Sweet & Maxwell.



laws, acknowledging that legal outcomes are often shaped by the broader context in which they operate.<sup>22</sup>

#### iv. Sociological Theory of Law

Sociological Theory of Law examines the relationship between societal values, public attitudes, and the development of biodiversity laws. This perspective highlights how laws reflect the collective values and priorities of a society, which can evolve over time. Public participation and advocacy play a crucial role in shaping biodiversity laws, as seen in movements that have led to the establishment of protected areas or the passing of stricter regulations on endangered species.<sup>23</sup> Sociological Theory underscores the importance of public engagement in the legal process, arguing that laws are more effective and legitimate when they are informed by the values and needs of the communities they serve. This approach also considers the role of education and awareness-raising in fostering a culture of conservation and environmental responsibility.<sup>24</sup>

### Conceptual Frameworks for Biodiversity Protection

#### A. Biodiversity Conservation

Biodiversity conservation is a central component of environmental protection efforts, focusing on preserving the variety of life on Earth by safeguarding ecosystems, species, and genetic diversity. Protected areas, such as national parks, nature reserves, and wildlife sanctuaries, play a crucial role in this endeavour. These areas are designated to protect significant habitats and species from human-induced threats like habitat destruction, pollution, and climate change.<sup>25</sup> Conservation strategies within these protected areas often include habitat restoration, anti-poaching measures, and legal protections against exploitation. Additionally, species recovery programs, which target critically endangered species, are essential for preventing extinctions. These programs involve breeding in captivity, reintroducing species into their natural habitats, and monitoring populations to ensure their recovery.<sup>26</sup> Together, these approaches form a robust framework for conserving biodiversity and maintaining ecological balance.

#### B. Sustainable Development

Sustainable development integrates biodiversity conservation into broader economic and social goals, recognizing that long-term economic growth and human well-being depend on healthy ecosystems. The concept of sustainable development, as outlined in the 1987 Brundtland Report, emphasizes the need to meet present needs without compromising the ability of future generations

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<sup>22</sup> Fisher, E. (2010). *Risk Regulation and Administrative Constitutionalism*. Hart Publishing, London

<sup>23</sup> Ebbesson, J. (2010). The Rule of Law in Governance of Complex Socio-Ecological Changes. *Global Environmental Change*, 21(2), 26-36.

<sup>24</sup> Organization of American States. (2015). *Environmental Rule of Law: Selected Essays*.

<sup>25</sup> United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC). (2018). *Protected Planet Report 2018*. UNEP-WCMC

<sup>26</sup> Seddon, P. J. (2010). From reintroduction to assisted colonization: moving along the conservation translocation spectrum. *Restoration Ecology*, 18(6), 796-802.



to meet their own needs.<sup>27</sup> This approach has been incorporated into global initiatives like the United Nations' Sustainable Development Goals (SDGs), particularly Goal 15, which focuses on life on land and the need to halt biodiversity loss.<sup>28</sup> Sustainable practices, such as sustainable agriculture, forestry, and fisheries, are vital in conserving biodiversity by reducing the pressure on natural habitats and species. For example, agroforestry practices that combine agriculture and tree planting help preserve biodiversity while providing economic benefits to local communities.<sup>29</sup> By aligning biodiversity goals with sustainable development, societies can achieve economic growth while ensuring the conservation of natural resources.

### C. Environmental Impact Assessment (EIA)

Environmental Impact Assessment (EIA) is a critical tool for evaluating the potential effects of development projects on biodiversity. The EIA process involves assessing the environmental consequences of proposed activities before they are carried out, to mitigate negative impacts.<sup>30</sup> EIAs are particularly important for large-scale infrastructure projects, which can lead to habitat loss, pollution, and other threats to biodiversity. Best practices for incorporating biodiversity considerations into EIAs include identifying key biodiversity areas, assessing cumulative impacts, and engaging stakeholders in decision-making processes.<sup>31</sup> Effective EIAs not only prevent environmental degradation but also contribute to the conservation of biodiversity by ensuring that development projects are planned and implemented in a way that minimizes harm to ecosystems and species. This proactive approach helps balance the need for economic development with the imperative of protecting biodiversity.

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<sup>27</sup> World Commission on Environment and Development (WCED). (1987). *Our Common Future*. Oxford University Press.

<sup>28</sup> United Nations (UN). (2015). *Transforming Our World: The 2030 Agenda for Sustainable Development*. UN.

<sup>29</sup> Food and Agriculture Organization of the United Nations (FAO). (2015). *Agroforestry and the Global Action Agenda for Sustainable Development*. FAO.

<sup>30</sup> Glasson, J., Therivel, R., & Chadwick, A. (2013). *Introduction to Environmental Impact Assessment*. Routledge.

<sup>31</sup> Convention on Biological Diversity (CBD). (2006). *Guidelines for Incorporating Biodiversity-Related Issues into Environmental Impact Assessment Legislation and/or Processes and in Strategic Environmental Assessment*. UNEP/CBD/COP/8/27/Add.1.



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## 5. Integration of Biodiversity into Environmental Law

### i. Policy and Legal Frameworks

The integration of biodiversity into environmental law is primarily achieved through a combination of international agreements and national laws that provide a legal basis for biodiversity protection. One of the most significant international agreements is the Convention on Biological Diversity (CBD), which was adopted in 1992 to promote the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic resources.<sup>32</sup> The CBD has been instrumental in shaping national biodiversity policies and encouraging countries to adopt comprehensive legal frameworks that address biodiversity conservation. At the national level, many countries have enacted laws and regulations that reflect the principles of the CBD, such as the Endangered Species Act (ESA) in the United States, which provides for the conservation of threatened and endangered plants and animals and the ecosystems on which they depend.<sup>33</sup> These laws establish the legal infrastructure for protecting biodiversity, including the designation of protected areas, the regulation of wildlife trade, and the enforcement of conservation measures.

### ii. Challenges and Opportunities

Despite the existence of robust legal frameworks, the protection of biodiversity faces significant challenges. Legal and institutional challenges, such as insufficient enforcement of biodiversity laws, lack of coordination among government agencies, and inadequate funding, often hinder effective biodiversity conservation (Pisupati & Prip, 2015). For example, while many countries have established protected areas, these areas are often under-resourced and lack the necessary enforcement to prevent illegal activities like poaching and deforestation. Additionally, there are challenges related to the integration of biodiversity considerations into other areas of law, such as land use planning, agriculture, and infrastructure development, which can lead to conflicts between conservation and development goals.<sup>34</sup> However, there are also opportunities to strengthen legal frameworks and improve enforcement. Enhancing international cooperation, increasing public awareness and participation, and leveraging new technologies for monitoring and enforcement are all strategies that can help address the challenges in biodiversity protection.<sup>35</sup> Moreover, updating and adapting existing laws to address emerging threats to biodiversity, such as climate change, can further reinforce the legal protections for biodiversity.

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<sup>32</sup> Convention on Biological Diversity (CBD). (1992). Text of the Convention on Biological Diversity. United Nations.

<sup>33</sup> Endangered Species Act (ESA), 1973. Public Law 93-205.

<sup>34</sup> Convention on Biological Diversity (CBD). (2018). Biodiversity and the 2030 Agenda for Sustainable Development. United Nations.

<sup>35</sup> Sands, P., & Peel, J. (2018). Principles of International Environmental Law. Cambridge University Press.





## 6. Case Studies Analysis

### Successful Implementation of Biodiversity Laws

Several case studies demonstrate the successful implementation of biodiversity laws, illustrating the effectiveness of well-crafted legal frameworks in conserving biodiversity. One notable example is Costa Rica, which has implemented a series of progressive environmental laws that have significantly improved the country's biodiversity conservation efforts. Costa Rica's Forest Law of 1996 played a pivotal role in reversing deforestation rates by promoting reforestation and protecting forested areas through financial incentives for landowners.<sup>36</sup> The law, combined with strong political will and public support, helped increase the country's forest cover from 21% in the 1980s to over 50% by the 2000s. Costa Rica's approach is often cited as a model for integrating economic incentives with legal protections, demonstrating that well-enforced laws can lead to tangible environmental benefits.

### Lessons Learned from Case Studies

These case studies provide valuable lessons for other countries seeking to enhance their biodiversity protection efforts. One key lesson is the importance of involving local communities in the implementation and enforcement of biodiversity laws. For instance, in Namibia, the establishment of communal conservancies under the Nature Conservation Amendment Act of 1996 has empowered local communities to manage their natural resources sustainably. This community-based approach has not only improved wildlife conservation but also generated economic benefits through eco-tourism.<sup>37</sup> The success of Namibia's conservancies underscores the importance of legal frameworks that recognize and support the rights of local communities, encouraging their active participation in conservation efforts.

### Challenges and Opportunities for Replication

While these successful case studies offer valuable insights, replicating their success in other contexts can be challenging. Factors such as political instability, lack of financial resources, and weak institutional capacity can hinder the effective implementation of biodiversity laws in other regions.<sup>38</sup> However, these challenges also present opportunities for innovation and adaptation. For example, leveraging international funding mechanisms, such as the Global Environment Facility (GEF), can provide the necessary financial support for biodiversity initiatives in developing countries. Additionally, adopting adaptive management practices that allow for flexibility in responding to changing environmental conditions and stakeholder needs can enhance the effectiveness of biodiversity laws. By learning from successful case studies and adapting their

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<sup>36</sup> Sánchez-Azofeifa, G. A., Daily, G. C., Pfaff, A. S., & Busch, C. (2003). Integrity and isolation of Costa Rica's national parks and biological reserves: examining the dynamics of land-cover change. *Biological Conservation*, 109(1), 123-135.

<sup>37</sup> Naidoo, R., Weaver, L. C., Stuart-Hill, G., & Tagg, J. (2011). Effect of biodiversity conservation on rural livelihoods in Namibia. *Conservation Biology*, 25(2), 1-6.

<sup>38</sup> Kiss, A. (1990). *Living with Wildlife: Wildlife Resource Management with Local Participation in Africa*. World Bank Technical Paper No. 130.



strategies to local contexts, countries can improve their biodiversity conservation efforts and achieve long-term sustainability.

## CONCLUSION

This article has explored the intricate relationship between biodiversity and environmental law, highlighting how legal frameworks play a crucial role in the conservation and sustainable use of biodiversity. The key findings underscore the significance of integrating biodiversity considerations into environmental law, as demonstrated through theoretical perspectives, conceptual frameworks, and case studies. The successful implementation of biodiversity laws in countries like Costa Rica and Namibia illustrates that well-crafted and enforced legal frameworks can lead to substantial improvements in biodiversity conservation. Moreover, the lessons learned from these case studies emphasize the importance of involving local communities and adapting legal strategies to specific contexts, which can enhance the effectiveness of biodiversity protection efforts.

The integration of biodiversity considerations into environmental law is essential for achieving long-term ecological balance and sustainability. As ecosystems face increasing pressures from human activities and climate change, it is imperative that legal frameworks evolve to address emerging challenges. Future research should focus on identifying innovative legal and policy approaches that can enhance biodiversity protection, particularly in regions with limited resources and institutional capacity. Additionally, there is a need for greater international cooperation and harmonization of biodiversity laws to ensure that conservation efforts are effective across borders. Policymakers must prioritize the development and enforcement of legal frameworks that not only protect biodiversity but also promote sustainable development and resilience to environmental changes.

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