

State Responsibility and Constitutional Mechanisms in Advancing Sustainable Technology and Environmental Resilience

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Abstract. Environmental problems have a direct impact on various aspects of life, including the state aspect. Constitutional law is required to proactively respond to environmental problems because of its position as a normative basis that establishes the roles, obligations, and methods of the state to address ecological problems. This paper aims to present data on the extent to which the state uses the law to make policies to reduce the impact of ecological damage. This research examines the concept of a green constitution, including the right to a good and healthy environment, the state's obligation to protect the environment, and the role of state institutions in regulating the implementation of green policies, using normative legal approaches and comparative analysis. In addition, there must be a balance between the state's obligation to protect the environment and utilize the environment in doing business. There are many things that can be done to achieve that balance, one of which is strengthening the legal framework that promotes environmentally friendly technological innovation.

1 Introduction

Indonesia is a country that is blessed with fertile nature that has many varieties of plant and animal types so that Indonesian nature is dubbed by the world as the node of civilization, entering an era of competition where humans compete in creating the most up-to-date technology coupled with the human birth rate that is not in line with the mortality rate making Indonesia face a challenge. The challenges faced or are being experienced by Indonesia are challenges that are also experienced and faced by all of humanity, namely the environmental crisis.

Climate change is widely recognized as one of the most significant challenges confronting humanity in the 21st century, producing extensive and complex effects on the environment, economies, and societies worldwide. The Intergovernmental Panel on Climate Change (IPCC) defines climate change as a long-term alteration in climate patterns, reflected in changes to the average conditions or variability of climate

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characteristics that persist for extended periods. Similarly, the Ministry of Environment and Forestry of Indonesia describes climate change as modifications in the physical conditions of the Earth's atmosphere, including shifts in temperature and rainfall distribution, which influence many aspects of human life over prolonged timescales. [1].

The real impact of this crisis can be seen in the degradation of Indonesia's biodiversity. Between 2000 and 2012, an estimated 6 million hectares of primary forest were lost, equivalent to 3% of the national land area, of which 40% of the loss occurred in areas that should have been protected. The conversion of forest land to oil palm plantations has led to a 50% decline in species wealth. This threat does not only occur on land, but also in coastal species such as mangroves and seagrasses.

As a country of law, Indonesia has a constitutional basis to protect nature. Article 33 paragraph (3) of the 1945 Constitution emphasizes that the earth, water, and natural resources are controlled by the state and used for the greatest possible prosperity of the people[2]. This constitutional promise obliges the state to preserve nature [3]. The failure of the state to fulfill this obligation, either through active action (*commission*) or omission (*omission*) in policy, can be categorized as a violation of human rights. Therefore, this paper will examine how the constitutional mandate can be used to encourage sustainable technology as a vital instrument in building environmental resilience [5].

All countries, rich and poor, must adapt to climate change. The benefits of adaptation are sometimes difficult to estimate because they depend on specific factors such as how well-adapted a country is to its current climate. The intensive use of coal at the beginning of the Industrial Revolution (1750–1850) was followed by oil from the end of the 19th century and natural gas in the 20th century. It has improved the average human economic prosperity globally, especially in the last two centuries, although without solving the deepening global North–South socioeconomic divide [5].

In the concept of green economy, a study Yusran and Afri Asnelly in their research offered the use of Green Politics Theory (GPT) in solving illegal fishing. GPT asserts that the marine ecological crisis is not only triggered by destructive fishing practices, but also by policy orientations that put economic development above ecological sustainability. Thus, solving illegal fishing requires a paradigm shift towards ecocentrism. In addition, GPT opens up a comparative space by showing how countries such as Ecuador and Germany have succeeded in institutionalizing ecological values through constitutions or green political parties. This approach also reinforces the idea that decentralization and local wisdom are strategic elements for building ecological awareness and expanding the base of marine protection [6].

Sudjono said in his research that the transformation towards a green economy has a significant impact on sustainable development through strengthening technological innovation, job creation, and improving resource efficiency, while reducing environmental degradation. The study confirms that the application of renewable energy, sustainable agricultural practices, circular economy models, and green infrastructure development can improve economic resilience and environmental quality. However, the study also identified various challenges such as large initial investment needs, technology and skills gaps, resistance to conventional industries, and suboptimal public policies[9].

The balance of roles between the people and the state must work together so that they can create a better environment and can stop the destruction of the environment more

severely. In research Bernadett Kiss, et al. stated in their research how the form, level, and impact of citizen participation in nature-based solutions (NBS) in 58 cases from 21 cities, as well as the extent to which such participation contributes to social and ecological sustainability. The results show that citizen participation is still generally tokenistic (limited to information and consultation), and although deeper participation does not necessarily improve ecological outcomes, it consistently strengthens social outcomes such as shared learning, a sense of belonging, increased environmental stewardship, and inclusivity. The study also found that in-depth participation was limited by rigid institutional structures, neoliberal logic, as well as low inter-stakeholder trust. However, mediation by civil society groups and sustainability frameworks can strengthen more democratic and socially just participatory processes[8].

Heleen L.P. Mees et al found the role of communities in protecting the environment through communities as a new style of engagement to government, community-led climate adaptation initiatives do not reduce the role of government, but instead create a new form of government participation, where local governments play the role of facilitators, supporters, and strategic partners instead of a single leader. A study of 20 cases in the Netherlands shows that government participation is flexible from simply providing permits and information to being actively involved as a partner and that the success of community adaptation depends heavily on the institutional support, coordination and legitimacy provided by the government. Overall, the research confirms that collaboration between communities and governments is key to realizing effective and sustainable climate change adaptation[12].

Studies in previous studies have highlighted aspects related to climate change and sustainability, ranging from the application of Green Politics Theory, strengthening the green economy, to citizen participation and new forms of government participation. However, all of these studies have not adequately examined how the state, through its constitutional mechanisms and mandates, is responsible for advancing sustainable technology as the main instrument of environmental resilience. Previous research tends to discuss sectoral policy aspects, institutional capacity, or community participation separately, without placing sustainable technology within the framework of constitutional governance that regulates the limits of state obligations, the direction of ecological development, and the relationship between the state and society in dealing with the climate crisis. Thus, the research space is still wide open to examine how the design of constitutional mechanisms can strengthen sustainable technological innovation and realize environmental resilience as part of the responsibility of the modern state.

2 Method

The problems in this study are solved through the application of the Normative Juridical method, which allows researchers to comprehensively examine state responsibilities and constitutional mechanisms through the analysis of legal texts. Through a literature study of primary, secondary, and tertiary legal materials, this study maps the basic norms, principles, and legal objectives related to sustainable development. Furthermore, the analysis was carried out with qualitative descriptive and legal interpretation techniques, such as systematic and teleological interpretation, to find the relationship between

constitutional norms and derivative policies [15]. Thus, the research problem is solved by logically connecting the hierarchy of legal norms so that conclusions are drawn about how the state is constitutionally obliged and should design mechanisms to encourage sustainable technology and strengthen environmental resilience.

3 Results and discussion

The definition of the state's responsibility to the people is packaged in the concept of a well-being state, this idea is known as a doorstep for the state which is labeled the poor law which often causes stigma, because it is only intended to provide assistance for the poor. A welfare state is aimed at the elderly and children, men and women, rich and poor, as best and as possible. Nature and the environment are always overlooked and forgotten when discussing the welfare of the country, as if the environment is just a tool towards welfare, even though all living things grow, survive, and reproduce because they coexist with other living and non-creatures that help provide food and other resources that sustain them. It is an interdependent relationship.

This relationship has been attached to Indonesian sovereignty. According to Jimly Asshidiqie, sovereignty is the concept of the highest power in a country. Furthermore, the concept of sovereignty was developed by Sri Soemantri into 4 (four) theories of sovereignty, namely the Sovereignty of God, State Sovereignty, Sovereignty of Law and People's Sovereignty. Apart from the 4 forms of sovereignty put forward by Sri Soemantri, the Indonesian constitution states the concept of the second environment which is enshrined in article 28h paragraph 1 of the 1945 Constitution. Environmental sovereignty which means that the power over a country is in the environment, or nature as the universe gets a higher position and position in the sense that in every state management that the environment gets a high position[11].

The government as the executor of the management of a country must guarantee the implementation of sovereignty because it has become a task that must be carried out, as intended by the Indonesian Basic Law. The existence of environmental sovereignty is not without reason because of the habits of Indonesian people who are very dependent on nature, it can be said that they are more familiar with nature than the government because in every need nature is always present to fulfill it. So that the implementation of environmental sovereignty not only protects the environment from damage but maintains the tradition of Indonesian people who understand each other with the environment which gives birth to an inner bond relationship with the environment and in the end if it continues to be carried out, the goals written in the Indonesian constitution can be realized.

Environmental law problems in Indonesia are basically born from an imbalance between progressive legal norms and weak implementation practices. Although the regulatory framework has incorporated the principles of sustainability, prudence, and protection of the right to a good environment, in practice law enforcement faces serious obstacles ranging from weak supervision of licensing, overlapping sectoral norms, to the dominance of short-term economic interests that often ignore the carrying capacity of the environment. The condition shows that justice's integrity is the main problem. One way to overcome it is by reformulating the Constitutional Court Justice's. Moreover, the

function of the external institution to supervise the judicial is constantly breaching the law and ethics. This situation made the Constitutional is getting worse [12]. When law enforcers violate the law itself, then people will reflect on why they should follow the rule of law, while law enforcers do not act reasonably and instead violate the rules. This will lead to legal chaos in society and distrust of a vital institution, namely the Constitutional Court.

The constitutional mechanism in protecting the environment and directing technological development basically works through a series of instruments of regulation, supervision, and testing inherent in the constitutional structure based on the 1945 Constitution. The idea to review acts as a mechanism of constitutional adjudication had actually been debated among the founding fathers of the nation in the preparation of the independence of Indonesia in 1945 [13]. Article 28H paragraph (1) and Article 33 paragraph (3) and paragraph (4) place the state as the responsible party to ensure that every development policy, including technological innovation, does not contradict the principles of ecological sustainability. This mandate is implemented through law-making authority by the legislature, policy formulation by the executive, and mechanisms *Judicial Review* by the Constitutional Court to test whether regulations related to technology and the environment are in harmony with the constitutional rights of citizens. In addition, external supervision mechanisms by state institutions such as the BPK and the Ombudsman are an important part of ensuring that natural resource management, technology licensing, and green economy policies run transparently and do not deviate from the principle of "people's prosperity" which is sustainable. Thus, the constitution not only provides basic norms, but also establishes a set of institutional mechanisms that allow the state to maintain environmental integrity while encouraging technological progress in a responsible and accountable manner.

Business and politics are often the main triggers of environmental damage when economic interests and power are more dominant than ecological interests. Collusion between business actors and political actors relaxes licensing, weakens supervision, and makes corporate violations left unpunished. This situation is exacerbated by the weak environmental law in disciplining the practice of destroying nature both due to regulatory loopholes, low deterrent effects, and inconsistent law enforcement. The Constitutional Court, as the guardian of the Constitution, plays a crucial role in maintaining the principle of checks and balances within Indonesia's political system. Within the framework of the separation of powers, the existence of mutual control among state institutions is regarded as a fundamental and essential element. Constitutionalism emphasizes that the separation of powers is intended to restrict governmental authority, thereby preventing the concentration of power in a single institution and avoiding domination, oppression, or arbitrary actions by those in power. To address such concerns, the Constitutional Court is granted the authority to adjudicate and resolve disputes related to constitutional matters [14].

One solution in the environmental aspect is the application of smart technologies such as smart grids and smart sensors, which contribute significantly to more efficient energy management and carbon emission reduction. In addition, technology-based waste management also shows great potential in supporting urban environmental sustainability. On the social side, smart technology must ensure inclusivity by paying attention to

vulnerable groups and the digital divide, where digital literacy and community empowerment are key to creating a sustainable social impact. However, implementation challenges such as infrastructure gaps, budget constraints, and human resource readiness remain obstacles that must be overcome.

The constitutional mechanism of state responsibility in preserving environmental sustainability is in line with the spirit of progressive law that places human welfare and ecological integrity as the main goal. It is not enough for the state to comply with the text of the regulation, but must actively use regulatory and supervisory powers to ensure that the use of natural resources does not exceed the carrying capacity of the environment. When economic interests clash with sustainability, the state is obliged to use its constitutional discretion to protect the environment as the basis of public welfare. Thus, the protection of nature becomes a constitutional mandate that demands state action that is adaptive, visionary, and in favor of the long-term interests of society and future generations [15].

A healthy democracy plays an important role in preserving nature because only in a transparent, accountable, and participatory political space can ecological interests be fought fairly. When the democratic process runs cleanly without corruption, policy manipulation, or political transactions, the public can oversee public decisions that have the potential to damage the environment and ensure that the state remains responsible for the principles of sustainability. Therefore, maintaining the quality of democracy is not only a political agenda, but also a fundamental condition for fair and sustainable environmental protection. The emergence of the “empty box” phenomenon in regional head elections poses a gradual threat to democracy. Instead of generating a wide range of candidates for the public to choose from, the multi-party system often results in political parties forming large coalitions that produce only a single pair of candidates. As a result, the democratic process achieved through significant struggle, cost, and challenges risks being undermined and manipulated by political elites who consolidate party support under the banner of coalition politics.

4 Conclusion

State responsibility in advancing sustainable technology and strengthening environmental resilience is fundamentally rooted in the constitutional mandate of the 1945 Constitution. Article 28H paragraph (1) and Article 33 paragraph (3)–(4) provide a clear normative foundation that obliges the state to protect the environment while ensuring that technological development aligns with ecological sustainability. The findings of this research show that constitutional mechanisms are essential to correct these deviations, yet their effectiveness depends heavily on the integrity of actors who run them. A healthy democracy, supported by strong rule of law and ethical governance, becomes a crucial prerequisite for preventing environmental exploitation and ensuring that sustainable technology can flourish. Thus, strengthening constitutional instruments, reforming governance practices, and ensuring accountable democratic processes are urgent steps to realizing a sustainable and resilient ecological future as mandated by the Constitution.

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References

1. N. C. Pepin *et al.*, “Climate changes and their elevational patterns in the mountains of the world,” *Rev. Geophys.*, vol. 60, no. 1, **2022**.
2. A. W. Asmorojati, “Hukum Pemerintahan Daerah dan Daerah Istimewa Yogyakarta dalam Bingkai NKRI,” Yogyakarta, **2020**.
3. Sujinah, A. Wardhono, and S. Yuniarti, “Localism and Cultural Preservation Policy in Indonesia: Ideas and Challenges,” *Adv. Soc. Sci. Educ. Humanit. Res.*, vol. 436, pp. 25–31, **2020**.
4. A. N. An, “Tanggung Jawab Negara Terhadap Eksistensi Masyarakat Pemukim Di Atas Air (Studi Kasus: Suku Bajo Desa Samabahari , Kabupaten Wakatobi),” *J. Huk. Pembang.*, vol. 54, no. 3, **2024**, doi: 10.21143/jhp.vol54.no3.1625.
5. F. D. Santos and P. L. Ferreira, “The Climate Change Challenge: A Review of the Barriers and Solutions to Deliver a Paris Solution,” pp. 1–32, **2022**.
6. Yusran and A. Asnelly, “Kajian Green Politics Theory Dalam Upaya Menangani Krisis Ekologi Laut Indonesia Terkait Aktifitas Illegal Fishing,” vol. 1, no. 2, pp. 35–53, **2017**.
7. Sudjono, “Green Economic Transformation: Opportunities and Challenges for Sustainable Development,” *Int. J. Sci. Soc.*, vol. 5, no. 5, pp. 825–835, **2023**.
8. B. Kiss, F. Sekulova, K. Hörschelmann, C. F. Salk, W. Takahashi, and C. Wamsler, “Citizen participation in the governance of nature-based solutions,” *Environ. Policy Gov.*, vol. 32, no. 3, pp. 247–272, 2022, doi: 10.1002/eet.**1987**.
9. H. L. P. Mees, C. J. Uittenbroek, D. L. Hegger, and P. P. J. Driessen, “From citizen participation to government participation: An exploration of the roles of local governments in community initiatives for climate change adaptation in the Netherlands,” *Environ. Policy Governance Environmental Policy Gov.*, vol. 19, pp. 198–208, **2019**, doi: 10.1002/eet.1847.
10. M. Muhaimin, *Metode Penelitian Hukum*. Mataram: Mataram University Press, **2020**.
11. Sodikin, “Gagasan Kedaulatan Lingkungan Dalam Konstitusi Dan Implementasinya Dalam Pelestarian Lingkungan Hidup,” *Masal. Huk.*, vol. 48, no. 3, **2019**.
12. I. Satriawan, S. Lee, S. N. Wijayanti, and B. Hidayat, “An Evaluation of the Selection Mechanism of Constitutional Judges in Indonesia and South Korea,” *Padjajaran J. Law*, vol. 10, no. 1, pp. 122–147, **2023**, doi: <https://doi.org/10.22304/pjih.v10n1.a7>.
13. I. Satriawan and K. A. Mokhtar, “The Constitutional Court’s Role in Consolidating Democracy and Reforming Local Election,” *Const. Rev.*, vol. 1, no. 1, **2015**.
14. I. Satriawan and K. A. Mokhtar, “The Role of Indonesian Constitutional Court in Resolving Disputes among the State Organs,” *Hasanuddin Law Rev.*, vol. 5, no. 2, pp. 159–179, **2019**, doi: 10.20956/halrev.v5i2.1669.
15. S. N. Wijayanti, L. T. Alw, T. Lailam, and K. Iswandi, “Progressive Legal Approaches of the Constitutional Justice Reasoning on Judicial Review Cases: Challenges or Opportunities?,” vol. 21, no. 2, pp. 219–240, **2025**.