

Green Economy Policies in the Digital Transformation of Forest Management in Indonesia

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Abstract. This study examines green economy policies in relation to Indonesia's digital transformation of forest management. It employs the normative juridical approach as well as the primary and secondary sources of legal materials. It demonstrates that the digital transformation policies of forest managements are implemented to reduce climate change and facilitate a green economy. The green economy approach underscores that sustainable development is premised upon improving human wellbeing and social equality considering environmental concerns. The instrumental theory uses a backward-looking approach and the substantive theory uses a forward-looking approach. The later adjusts to technological developments and protects interests disrupted by them. Hence, it can be used in making forestry digital transformation policies. Furthermore, the application of the legal theory of development exhibits the absolute and crucial importance of the digital transformation policies as a way of advancing forest management, community participation policies as well as transparency in environmental and forest management. They call for a holistic, all-encompassing, and interdisciplinary approaches. In view of this, this study presents novelty in the forestry-related digital transformation policies, which aim at lessening the harm to forests and ecosystems and the planet.

Keywords: Green economy, policy, forestry, digital transformation

1. Introduction

The growth of a green economy is a tendency in the globalization of the fourth industrial revolution. The Internet and digital technology are working together more than ever before in the Industrial Revolution 4.0 (Society 5.0), especially after the Covid-19 pandemic hit the world.¹ The internet's existence and optimization have sparked human ingenuity to discover new economic resources, or the "digital economy".² According to Klaus Schwab's description at the 2016 World Economic Forum Annual; "*The fourth industrial revolution is technological revolution, that is blurring the lines between the physical, digital, and biological spheres.*"³

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- 1 Mario Hermann, Tobias Pentek, and Boris Otto (2015), *Design Principles for Industrie 4.0 Scenarios: A Literature Review*, p.1; available at: <https://doi.org/10.13140/RG.2.2.29269.22248> (accessed on March 1, 2023).
- 2 Organisation for Economic Co-operation and Development (2013), *The Digital Economy 2012*, p.10; available at: <https://www.oecd.org/daf/competition/The-Digital-Economy-2012.pdf> (accessed on March 1, 2023).
- 3 Klaus Schwab (2016), *The Fourth Industrial Revolution*, p. 19, Genewa: World Economic Forum.

Since the New Order era, Indonesia, one of the nations with the fourth-largest forest in the world, has relied on forests to maintain its economic growth. In order to achieve sustainable development in Indonesia, forest sustainability becomes essential. The UN General Assembly has proclaimed March 21 to be International Day of Forests since 2012. The theme used in 2022 is: “Forests and sustainable production and consumption.” The implication of this theme is that all parties involved must discontinue various unsustainable production and consumption habits that have a detrimental effect on the viability of forest ecosystems.⁴ It is time for all parties involved to genuinely and credibly support all governmental and societal initiatives for sustainable forest management.⁵ The following are the nations that have destroyed the most forests worldwide, with Indonesia taking the fourth spot. The data is based on a report from the World Resources Institute in 2022. Brazil ranks first with total forest area damage reaching 1.5 million hectares. After Brazil, then Congo (with 499 thousand hectares of damage), Bolivia (291 thousand), Indonesia (202 thousand), and Peru (154 thousand). There are still a number of other countries that have experienced forest destruction, where forest destruction, throughout 2022, has released emissions of 2.5 billion tons of carbon dioxide equivalent.⁶

Given that Indonesia has one of the largest forested areas in the world and that forest have historically supported the country’s economy since the New Order era, preserving the sustainability of Indonesia’s forests is crucial to achieving sustainable development.⁷ In 2022, Indonesia had 125.76 million hectares (ha) of total forest area, according to the Ministry of Environment and Forestry Report. This amount is equal to 62.97% of Indonesia’s total land area of 191.36 million hectares, with a breakdown of land-based forest areas reaching 120.47 million ha and water-based forest regions reaching 5.32 million hectares.⁸ Indonesia is a nation with a very high degree of biodiversity and endemism as a result of its geographic position, and it has the highest amount of biodiversity of any nation on earth.⁹

Halting global warming is one of the key outcomes of the world high-level meeting on climate change (COP-26, United Nations Framework Convention on Climate Change / UNFCCC) in Glasgow England, in 2021.¹⁰ The Indonesian government issued several policies in response to the meeting’s outcomes, including (1) Law No. 16 of 2016 regarding ratification of the Paris Agreement to the United Nations Framework Convention on Climate Change and (2) Law No. 11 of 2017 regarding ratification of the Minamata Convention; (3) Law No.6 Year 2023 concerning Stipulation on Government Regulation in Lieu of Law No. 2 Year 2022 concerning Job Creation Into Law, which also highlights the significance of environmental and forestry sustainability in the process of facilitating business and increasing job opportunities;¹¹ (4) Law No. 71 of 2021 and Presidential Regulation No. 98 of 2021 on the Implementation of Carbon Economic Value to Achieve Nationally Determined Contribution

- 4 Asri Laksmi Riani, Sri Subanti, and Islamiyah (2022), “Improving Green Innovation Performance By Smes In Indonesia,” *Journal of Southwest Jiaotong University*, vol. 57, no. 6, at p. 167–181; available at: <http://jsju.org/index.php/journal/article/view/1393/1383> (accessed on January 1, 2023).
- 5 Pusat Studi Lingkungan Hidup (2022), *Peringatan Hari Hutan Internasional* (Commemoration of International Day of Forests), March 21, 2022; available at: <https://pslh.ugm.ac.id/peringatan-hari-hutan-internasional/> (accessed on January 23, 2023).
- 6 Amandra Megarani (2022), *Hutan Tropis Hilang 11,1 Juta Hektare* (11.1 Million Hectares of Tropical Forest Lost), May 1, 2022; available at: <https://www.forestdigest.com/detail/1709/hutan-tropis-hilang> (accessed on January 23, 2023).
- 7 Asri Laksmi Riani, Sri Subanti, and Islamiyah (2022), “Improving Green Innovation Performance By Smes In Indonesia,” *Journal of Southwest Jiaotong University*, vol. 57, no. 6, at p. 167–181; available at: <http://jsju.org/index.php/journal/article/view/1393/1383> (accessed on January 1, 2023).
- 8 Shilvina Widi (2023), *Luas Kawasan Hutan Indonesia Mencapai 125,76 Juta Hektare* (Indonesia’s Forest Area Reaches 125.76 Million Hectares), January 2, 2023; available at: <https://dataindonesia.id/agribisnis-kehutanan/detail/luas-kawasan-hutan-indonesia-mencapai-12576-juta-hektare> (accessed on February 1, 2023).
- 9 Dody Ruswandi et al. (2021), “Conflict Analysis of Forest and Land Fires in Implementing Collaborative Governance on Disaster Management in Kalimantan Indonesia,” *Journal of Southwest Jiaotong University*, vol. 56, no. 2, at p. 10–21; available at: <https://doi.org/10.35741/issn.0258-2724.56.2.2> (accessed on December 4, 2022).
- 10 V. Jaime Andrés Betancourt, Gloria Yaneth Florez Yepes, and Diego Hernández García (2022), “Innovation In Agricultural Systems Facing Climate Change,” *Journal of Southwest Jiaotong University*, vol. 57, no. 1, at p. 257–268; available at: <https://doi.org/10.35741/issn.0258-2724.57.1.24> (accessed on January 11, 2023).
- 11 Kementerian Lingkungan Hidup dan Kehutanan (2022), *Perjalanan 5 Dekade Pengelolaan Lingkungan Hidup Indonesia* (Journey of 5 Decades of Indonesian Environmental Management), June 13, 2022; available at: <http://ppid.menlhk.go.id/berita/siaran-pers/6584/perjalanan-5-dekade-pengelolaan-lingkungan-hidup-indonesia> (accessed on January 12, 2023).

Targets and Control of Greenhouse Gas Emissions in National Development, set an objective for Indonesia to reduce greenhouse gas emissions by about 29% on its own and 41% with international assistance in 2030.¹²

Article 33 paragraph (4) of the 1945 Constitution of the Republic of Indonesia mandates the management of forestry natural resources, which is related to sustainable development and an environmentally sound economic development (green economy). Deforestation has an impact on climate change, this is because trees absorb about a third of carbon emissions produced worldwide.¹³ In addition to being an essential home for wildlife, forests also provide food and a means of subsistence for the residents who live in or near them. Ironically, the main forces behind the creation of novel viruses, like the causes of SARS, Ebola, and the present Covid-19, are forest loss and an increase in human-wildlife contact.¹⁴

In order to encourage economic growth and a favorable environment for investment, the notion of sustainable development must be a point of reference.¹⁵ The key elements of sustainable development are the integration principle, sustainable use, intragenerational equity, and intergenerational equity.¹⁶ Currently, the economic, social, and environmental pillars of sustainable development are adopted by the global development discourse. The idea of a green economy has emerged as the movement for sustainable development has become more intense. Green economy evolves into a philosophy that promotes sustainable growth and the eradication of poverty.

In forest areas, massive forest destruction still occurs. It is typical practice to involve many parties in an organized and methodical manner in order to carry out activities such as illegal logging, forest encroachment, unpermitted plantations in forest regions, illicit mining, and other illegal methods.¹⁷ The perpetrators of such acts are typically those who live close to the forest, laborers or loggers, brokers, transportation providers, investors, companies, or cooperatives. Furthermore, they frequently work with government officials or law enforcement representatives, as well as political figures to make sure the security of these activities.¹⁸

On the other hand, Indonesia's forest management faces a variety of serious issues, notably declining forest cover, deforestation, seizure of forest land, illegal logging, and forest fires, which raise carbon emissions.¹⁹ Furthermore, Indonesian policies and management of its forest areas continue to fall short of the standards set forth by good forest governance. Such can be seen from the quality of policies that still overlap, giving rise to multiple interpretations in law enforcement and conflicts over tenure (land) for forest management and utilization permits with various interested parties, indigenous and local communities with government and private/corporate institutions due to permit uncertainty.

12 DW (2021), *Pandemi COVID-19 Tahun 2020 'Menghancurkan' Hutan Dunia* (The 2020 COVID-19 Pandemic 'Destroyed' the World's Forests), February 26, 2021; available at: <https://www.dw.com/id/pandemi-covid-19-tahun-2020-menghancurkan-hutan-dunia/a-56710524> (accessed on December 24, 2022).

13 Farid Aulia et al. (2020), "Local Knowledge of North Sumatera Coastal Communities on Sustainable Mangroves Identification and Types," *Journal of Southwest Jiaotong University*, vol 55, no. 3, at p. 1–9; available at: <https://doi.org/>(accessed on December 23, 2022).

14 Sigit Riyanto (2020), *Kertas Kebijakan: Catatan Kritis Dan Rekomendasi Terhadap RUU Cipta Kerja* (Policy Paper: Critical Notes and Recommendations on the Job Creation Bill), p.17, Yogyakarta: Fakultas Hukum UGM.

15 Andri Gunawan Wibisana (2017), "Keadilan Dalam Satu (Intra) Generasi: Sebuah Pengantar Berdasarkan Taksonomi Keadilan Lingkungan," (Justice Within One (Intra) Generation: An Introduction Based on the Taxonomy of Environmental Justice), *Mimbar Hukum-Fakultas Hukum Universitas Gadjah Mada*, vol. 29, no. 2, at p. 292–307; available at: <https://journal.ugm.ac.id/jmh/article/view/19143> (accessed on December 30, 2022).

16 Suryanto (2006), *Illegal Logging: Sebuah Misteri Dalam Sistem Pengrusakan Hutan Indonesia* (Illegal Logging: A Mystery in Indonesia's Forest Destruction System), p.1, Samarinda: Balai Penelitian dan Pengembangan Kehutanan Kalimantan.

17 Bambang Santoso Haryono et al. (2022), "The Role Of Actors In The Implementation Network Of Community Empowerment Policies In Forest Management: A Case Study Of The Forests Of Yogyakarta, Indonesia," *Journal of Southwest Jiaotong University*, vol. 57, no. 3, at p. 381–393; available at: <https://doi.org/10.35741/issn.0258-2724.57.3.32> (accessed on January 21, 2023).

18 Mari Mulyani and Paul Jepson (2016), "Does the 'One Map Initiative' Represent a New Path for Forest Mapping in Indonesia? Assessing the Contribution of the REDD+ Initiative in Effecting Forest Governance Reform," *Forests*, vol. 8, no. 1, at p. 14; available at: <https://www.mdpi.com/1999-4907/8/1/14/pdf> (accessed on January 12, 2023).

19 Rosyda Nur Fauziyah (2020), *Pengertian Ekonomi Hijau: Awal Mula, Tujuan, Prinsip, Dan Macamnya* (Understanding Green Economy: Beginnings, Goals, Principles, and Types), available at: <https://www.gramedia.com/literasi/pengertian-ekonomi-hijau/> (accessed on January 22, 2023).

2. Literature Review

A. Green Economy

Several international organizations are still debating how to define the term “green economy” as of right now. Various definitions of “Green economy” presented are:

- i. The United Nations Environment Program (UNEP/2011) defines a green economy as a system of economic activities related to the production, distribution, and consumption of goods and services that increase long-term societal well-being without placing massive environmental risks or ecological scarcity on the shoulders of future generations.
- ii. The Government of Indonesia (2010) describes a green economy as a paradigm for development that sets a strong emphasis on internalizing the expenses associated with the depletion of natural resources and environmental degradation. The green economy is also a system of initiatives to eradicate poverty, produce decent employment opportunities, and guarantee long-term economic prosperity.

By reducing the use of natural resources as well as the use of carbon, the green economy promotes social well-being.²⁰ A Green Growth initiative has also been developed by the Indonesian government as a climate change mitigation strategy. The policy mix is covered in this stage in terms of content, structure, and funding.

This action can take various forms, such as replacing climate change-related elements in the National Medium-Term Development Planning (RPJMN) 2020–2024. The initiatives include enhancing environmental quality, boosting disaster resilience, combating climate change, and utilizing low carbon. In order to actualize the responsible use of forestry natural resources, prevent and decrease pollution, and provide chances to promote social welfare by establishing a green economy, it is envisaged that green economic growth should be achieved.

B. Digital Transformation

According to the Big Indonesian Dictionary, ‘*transformasi*’ means a change in form (shape, nature, function, etc.); while ‘*digital*’ is related to numbers for certain calculation systems. Furthermore, the definition of Digital Transformation is a process of utilizing digital technology to bring about significant changes in various aspects of life so that needs can be met more quickly, easily, and practically.

The process of “digital transformation” involves radically altering how a department or organization provides value to customers in order to integrate digital technology into all business areas. A wider scope of digital transformation leads to a shift in the department’s prevailing culture.²¹

In the business context, digital transformation refers to how technology supports business revolution with various fields of technology supporting it such as the Internet, Big Data, AI, Machine Learning, Deep Learning, Cloud Computing, Blockchain, Internet of Things (IoT), Augmented Reality (AR), Virtual Reality (VR), Metaverse.

Actually, there is nothing particularly novel about the concept of digital transformation. This concept emerged several decades ago, in the era of the industrial revolution 3.0 when smart machines such as computers and software were developed. However, during the Covid-19 epidemic, there was a significant transition from analog to digital technology that affected practically every sector of society, including forestry. As a result, the digital revolution of forestry was accelerated.²² Reduced forest damage, ecosystem monitoring, dissemination of research

20 Opayemi Olajide Adebisi et al. (2020), “Impact of Malaysian Green Technology Financial Scheme on Business Performance of Renewable Energy Producers,” *Journal of Southwest Jiaotong University*, vol. 55, no. 6, at p. 1–13; available at: <https://doi.org/10.35741/issn.0258-2724.55.6.19> (accessed on January 11, 2023).

21 BAMAIUMA (2022), *Transformasi Digital: Pengertian Lengkap Buat Solusi Usaha* (Digital Transformation: Complete Understanding for Business Solutions), August 6, 2022; available at: <https://bamai.uma.ac.id/2022/08/06/transformasi-digital-pengertian-lengkap-buat-solusi-usaha/> (accessed on March 20, 2023).

22 Sustainable Development Commission (2020), *History of Sustainable Development*, available at: https://www.sd-commission.org.uk/pages/history_sd.html (accessed on February 21, 2023).

findings, and support for biodiversity preservation are all a result of the development of digital transformation, which has also an impact on the struggles of saving the planet.

The Government of Indonesia has attention to the development of digital technology which is also related to grow the green economy. Strengthening the digital transformation aspect, which is related to many things including the green economy sector, is stated in Government Regulation No. 46 Year 2021 concerning Post, Telecommunications and Broadcasting. Digital transformation must be carried out comprehensively so that it is beneficial for people's lives in all fields. Meanwhile, Law No. 6 Year 2023 concerning Stipulation on Government Regulation in Law No. 2 Year 2022 concerning Job Creation Into Law, which discusses many points, including digital transformation and the green economy. The regulations will continue to be refined, to provide guarantees to the community, especially on employment, land, environmental and forestry issues.

Apart from that, special attention to the issue of digital transformation and the green economy was implemented with a joint agreement between Indonesia and South Korea on September 13 2023. The governments of South Korea (South Korea) and Indonesia launched the Green Digital Economy Platform or GDEP which will increase transformative digital innovation in the technology sector. and environmentally friendly businesses. The launch of GDEP was held in Seoul, South Korea, attended by Presidential Chief of Staff Moeldoko, founder of HumanX / DQ Institute Yuhyun Park, and Chairman of the Presidential Commission for Carbon Neutrality and Growth Kim Sang-Hyup. It is possible that other global collaborations will be carried out, in order to realize the wider green economy that will have an impact on sustainable development throughout the globe.

3. Research Methods

This study employs primary, secondary, and non-legal sources to conduct a normative juridical law research. Primary legal material in the form of Law No.6 Year 2023 concerning Stipulation on Government Regulation in Law No. 2 Year 2022 concerning Job Creation Into Law revokes and replaces Law No. 11 Year 2020 (the "Job Creation Law") in the forestry sector (UU No. 41 of 1999), and in the field of Prevention and Eradication of Forest Destruction (UU No. 18 of 2013), and the international convention Paris Agreement to The United Nations Framework Convention on Climate Change. In addition, this study uses secondary legal materials, such as legal opinions, doctrines, and ideas drawn from both legal and non-legal literature, to explain main legal documents. Both statutory method and conceptual approach are used in this investigation. In an endeavor to actualize a green economy, this paper examines the legal policy guidelines for forestry digital transformation and investigates the worldwide problems of the climate change agenda on many elements of green economy-focused forestry sector regulations.

4. Result and Discussion

As a source of production, a carrier or bearer or media, a source of health and a source of economic gain, forests naturally perform strategic natural tasks. One of the Indonesian government's plans for economic change is the establishment of a green economy. Through the preservation of the natural equilibrium, this approach aims to build a sustainable economy. A system of economic exploitation that has historically tended to harm the environment is seen as having to be replaced by the green economy. Technology-based policy innovations are needed for forest management activities in order to help address today's extremely complex forest governance issues. Additionally, data covering a large geographic region, integrated at all levels of management, and need to be accessible quickly are needed for forest management activities. Due to the limited human resources available for its administration, it is crucial to have a digital transformation in place in order to access distribution details for forests.

A. Implementing green economy policies through legal means

The development of a green economy, including the creation of future carbon commodities to be traded, depends greatly on forests as keepers of water supplies, as well as their conservation functions and other environmental

services. The global status quo is being transformed by the green economy on a universal scale. The principle of sustainable development was the result of the declaration of the UN Conference on the Environment in Stockholm in 1972,²³ then this principle was contained in the 1987 Brundtland Commission Report,²⁴ then it was again discussed in the Declaration of The UN Conference on Environment and Development in Rio de Janeiro in 1992,²⁵ then discussed at the Johannesburg Earth Summit (Earth Summit) in 2002, in the end, the Sustainable Development Goals (SDGs) were formed in 2016.

Procedural rights in the framework of fulfilling environmental rights are regulated in the Aarhus Convention (*Convention Access to Information, Participation and Decision Making and Access to Justice in Environmental Matters*). Article 1 of the Aarhus Convention states: “*In order to contribute to the protection of the right of every person of present and future generations to live in an environment adequate to his or her health and well-being, each Party shall guarantee the rights of access to information, public participation in decision-making, and access to justice in environmental matters in accordance with the provisions of this Convention.*” According to Article 1 of the Aarhus Convention, the state must specifically ensure that the rights to information access, community participation in environmental decision-making, and access to justice are upheld in order to satisfy the right to the environment.

According to Mochtar Kusumaatmadja’s development law theory, which is based on the premise that there is order or certainty in development or renewal activities, the role of law in national development is described by the words “as a method of community renewal” or “as a means of development.” Law in the sense of rules or legal regulations can certainly serve as a tool (regulator) or a means of development in the sense of directing human activity in the direction sought by development or reform. It is something that is wanted or even judged (absolutely) required. Law is supposed to perform both of these duties in addition to its more traditional ones, which include ensuring certainty and order.²⁶

The right to the environment is directly tied to community involvement in environmental management. The Republic of Indonesia’s 1945 Constitution guarantees everyone the right to a safe and healthy environment.²⁷ After the amendment, the provisions were formulated in Article 28H paragraph (1) which emphasized “Every person shall have the right to live in physical and spiritual prosperity, to have a home and to enjoy a good and healthy environment, and shall have the right to obtain medical care.”

Article 33 paragraph (4) of the 1945 Constitution of the Republic of Indonesia contains the Principles of sustainable development and environmentally sound economic development, then, explicitly in the “considering” section b of Law no. 32 of 2009 concerning Environmental Protection and Management (PLH), amendments to Law no. 23 of 1997 concerning Environmental Management and is still valid today as the main environmental law, including for the forestry sphere.

Article 1 of Law No. 32 of 2009 Concerning Environmental Protection and Management (UU PPLH), which exclusively controls environmental economy, underlines those environmental economic instruments are a collection of economic strategies to support the Government, including Central and Regional Governments, towards maintaining environmental functions. Law No. 32 of 2009 concerning Environmental Protection and Management (UU PPLH) also lays out indicators of economy and development planning that include green gross domestic product (green GDP), which takes into account environmental harm and natural resource decline. The calculation of green GDP technically focuses on the subcategories of forestry and logging; specifically, in the agricultural, forestry, and fisheries spheres.

23 Philippe Sands and Jacqueline Peel (2012), *Principles of International Environmental Law*, p.1, Cambridge: Cambridge University Press.

24 I Annex (1992), “Report of the United Nations Conference on Environment and Development,” *Rio de Janeiro (3–14 June 1992) A/CONF* vol. 151, no. 26, at p. 12.

25 Pusat Studi Lingkungan Hidup (2022), *Peran Serta Masyarakat Dalam Pengelolaan Lingkungan Hidup* (Community Participation in Environmental Management), January 11, 2022; available at: <https://pslh.ugm.ac.id/peran-serta-masyarakat-dalam-pengelolaan-lingkungan-hidup/> (accessed on February 3, 2023).

26 Mochtar Kusumaatmadja (2002), *Konsep-Konsep Hukum Dalam Pembangunan* (Legal Concepts in Development), p.1, Bandung: PT Alumni.

27 Muhammad Rizky Septian (2022), *Optimis Mewujudkan Ekonomi Hijau Untuk Pembangunan Indonesia Yang Berkelanjutan* (Optimistic about realizing a green economy for Indonesia’s sustainable development), May 11, 2022; available at: <https://www.viva.co.id/vstory/opini-vstory/1473897-optimis-mewujudkan-ekonomi-hijau-untuk-pembangunan-indonesia-yang-berkelanjutan> (accessed on January 12, 2023).

According to Article 3 Letter D of Law No. 41 of 1999 Concerning Forestry, one way to implement forestry is to increase capacity and enhance community capacity and empowerment in a participative, just, and environmentally sound manner. This will help to create social and economic resilience.

The implementation of sustainable development initiatives in Indonesia is contained in the Law No.6 Year 2023 concerning Stipulation on Government Regulation in Law No. 2 Year 2022 concerning Job Creation Into Law, revokes and replaces Law No. 11 Year 2020 (the “Job Creation Law”) in the field of Environmental Protection and Management (UU No. 32 of 2009), in Article 1 point 3 states that “Sustainable development is a conscious and deliberate endeavor that integrates environmental, social, and economic factors into a development strategy to preserve the integrity of the environment as well as the safety, capability, welfare, and quality of life of the present and future generations”.

Based on the scientific report of the UN High Level forum entitled “Principles, Priorities and Pathways for Inclusive Green Economies” on Sustainable Development, there are 5 principles in the concept of a Green Economy as follows: 1) The Wellbeing Principle; 2) The Justice Principles; 3) The Planetary Boundaries Principle; 4) The Efficiency and Sufficiency Principle; 5) The Good Governance Principles.

Ecological justice is a novel idea in the conceptual discourse on justice. The advent of numerous natural disasters, particularly the clearing of forests following the industrial revolution 4.0, is one of the causes, particularly in light of global warming and climate change. According to Andrew Dobson, who asserts that social justice serves a purpose to encourage a sustainable development, there is a connection between social justice and ecological justice (sustainable development).²⁸ So that the rights to welfare are understood in relation to social justice and ecological justice.

A crucial component of sound and legal environmental decision-making in a democratic manner is community participation, sometimes referred to as public participation. The fulfillment of the community’s right to a good environment is encouraged through community engagement, a channel that is made available to the community. At the moment, every level of policy—internationally, regionally, nationally, and locally—recognizes the value of the community participation process.²⁹

Based on the above analysis, the Law No.6 Year 2023 concerning Stipulation on Government Regulation in Law No. 2 Year 2022 concerning Job Creation Into Law revokes and replaces Law No. 11 Year 2020 (the “Job Creation Law”) through a development legal theory approach in the field of environmental and forestry policy, in the policy-making process of Environmental Protection and Management (UU No. 32 of 2009) and Law no. 41 of 1999 concerning Forestry and Law no. 18 of 2013 concerning Prevention and Eradication of Forest Destruction (P3H) involves community participation and transparency, including the creation of environmental licensing instruments and supervision, and it works best when the community is involved, takes part in the creation of environmental papers, and actively asserts its rights to the environment. However, the implementation of community involvement in environmental and forest management has hit a “setback” and is not yet in line with the non-regression principle.

The UN General Assembly adopted Resolution 66/288 in 2012, which was titled “The Future We Want.” The statement “we do not backtrack from our commitment to the outcome of the 1992 Rio Meeting” appears in paragraph 20 of the treaty. Attaining sustainable development was one of the meeting’s key commitments. Additionally, it was underlined at the World Conservation Congress gathering in Korea in 2012 that it is crucial to pay attention to sustainable development. In order to achieve sustainable development, the IUCN issued Resolution 128 at the summit calling on nations to include the principle of non-regression into their laws and policies.³⁰

The involvement and function of local and customary communities are crucial in the framework of legislation formation policies in the fields of forestry and the environment because they can reduce environmental pollution and forest damage. Additionally, a variety of approaches, such as holistic, all-encompassing, and interdisciplinary approaches, must be used in the policy-making process.

28 Amartya Sen (2009), *The Idea of Justice*, p.52-53, Massachusetts: The Belknap Press of Harvard University Press.

29 Andri Gunawan Wibisana (2022), *RKUHP Dan Regresi Hukum Lingkungan Indonesia* (Draft Criminal Code and Indonesian Environmental Law Regression), September 13, 2022; available at: <https://www.kompas.id/baca/opini/2022/09/13/rkuhp-dan-regresi-hukum-lingkungan-indonesia> (accessed on January 3, 2023).

30 Makmun (2016), “Green Economy: Konsep, Impelentasi Dan Peran Kementerian Keuangan,” (Green Economy: Concept, Implementation and Role of the Ministry of Finance), *Jurnal Ekonomi Dan Pembangunan*, vol. 19, no. 2, p.1-15.

a. *Green economy in forest management: Concepts and strategies*

A green economy, according to the United Nations Environment Program (UNEP), is one that is focused on boosting human welfare and social fairness while considerably lowering environmental risk and ecological scarcity. Development must be based on the idea of sustainable development since it attempts to increase human welfare. Sustainable development is defined as growth that satisfies present demands without jeopardizing the ability of future generations to fulfill their own needs in the 1987 report *Our Common Future* by the World Commission on Environment and Development (WCED). This indicates that development is being done for both the present and the future.³¹

The idea of a green economy was developed to help both sustainable development and the reduction of poverty. However, because there isn't a sustainable development model that applies to all nations, the idea of a green economy is interpreted differently in each nation, taking into account its unique set of limitations. A green economy is defined simply as economic activity that does neither affect nor harm the environment. The United Nations Environment Program (UNEP) provides the following definition of a "green economy," which it relates to the idea of an economy that may increase social welfare and justice:

"Greening the economy refers to the process of reconfiguring business and infrastructure to deliver better returns on natural, human and economic capital investments, while at the same time reducing greenhouse gas emissions, extracting and using less natural resources, creating less waste and reducing social disparities."

Therefore, a green economy is an economic activity that is intended to have an impact on achieving justice, justice for society, the environment, and the conservation of natural resources, in addition to boosting people's wellbeing, which is the ultimate purpose of economic activity. The green economy philosophy seeks to strike a balance between social justice and economic well-being for all while lowering the likelihood of environmental and ecological harm. The green economy in this instance is a model of economic growth based on sustainable development.³²

In order to be handed on to future generations and leave a lasting legacy for forebears, it is crucial to advance the green economy concept and consider how development affects environmental harm. Therefore, there are a number of ways to begin implementing green economic growth so that it may be done properly in the near future. The following are some of the policies the Indonesian government is pursuing to realize a green economy:³³

- (1) Low-carbon development in line with the National Medium-Term Development Plan for 2020–2024 (RPJMN).
- (2) The net zero emissions strategy, which includes net sinks in the forestry and land sectors in 2030 and sets a plan to attain net zero emissions in 2060.
- (3) Provision of a number of green stimulus to encourage increased realization of the green economy.

The concept of a green economy as a tool for enacting policy has been established and stipulated, and it entails a carbon roadmap scheme that entails carbon trading (cap and trade) and a carbon tax (cap and tax) scheme to reduce emissions, one of which is through Harmonization of Tax Regulations (HPP), which contains several points regarding carbon taxes and the Presidential Decree on Carbon Economic Value (NEK).

A supporting ecosystem for achieving net zero carbon emissions can be created by legislation relating to the carbon sales plan, such as the Indonesia Renewable Energy Laws and Regulations (RUU EBT). By engaging in bilateral and multilateral climate change and green economy diplomacy in a number of discussion forums in order to achieve the Paris Agreement and SDGs targets and join the P4G, or Partnership for Green Growth and Global Goals 2030, a network of international partnerships aimed at accelerating green development.

For the achievement of a sustainable environment and to prevent forest and environmental damage due to poor management, the management of forestry natural resources and the environment is inextricably linked to the

31 Velix Wanggai (2012), *Menuju Ekonomi Hijau* (Towards a Green Economy), p.1, Jakarta: Jurnal Nasional.

32 Joko Widodo (2022), *Presiden Jokowi Paparkan Strategi Indonesia Wujudkan Ekonomi Hijau* (President Jokowi Explains Indonesia's Strategy to Realize a Green Economy), Januari 20, 2022; available at: https://www.setneg.go.id/baca/index/hadiri_wef_presiden_jokowi_paparkan_strategi_indonesia_wujudkan_ekonomi_hijau (accessed on January 10, 2023).

33 Kementerian Lingkungan Hidup dan Kehutanan (2021), *The State of Indonesia's Forests 2020*, p.1, ed. Siti Nurbaya Jakarta: Kementerian Lingkungan Hidup, available at: https://www.menlhk.go.id/site/single_post/4696/the-state-of-indonesia-s-forests-2020 (accessed on January 12, 2023).

effect of legislative and political factors. The main issue with the way regulations are organized is a paradigm issue in the agenda for legal reform (which goes beyond simply changing or harmonizing the law), where the constitution requires people to focus on merely legal politics. High-level political commitment and leadership, both nationally and regionally, backed by the larger community, are essential to realize a green economy and attain a green economic growth.

b. Implementation of green economy in forestry: Challenges

Since the New Order era, Indonesia, one of the nations with the greatest forest areas worldwide, has relied on forests to support its economic development. Various nations around the world are currently dealing with the issue of depleting natural resources, energy resources, environmental resources, and food supplies. As more individuals became aware of the advantages of sustainable activities, the “green” lifestyle started to emerge as a solution to this issue. The earth’s ability to sustainably support the needs and welfare of people around the world is, however, being threatened by climate change and global warming. Since the 1970 s, Indonesia has been experimenting with the idea of sustainable development, but it is still far from where it should be. In order to achieve a green economy, a variety of challenges must be overcome, such as the following:

- (1) Creating and improving policies, rules, and operational tools in the environmental and forestry sectors; enhancing climate resilience through restoration initiatives, such as through the management and restoration of peatland and mangrove ecosystems; and rehabilitating forests and other land. Political will and policy inventiveness are required in other policy areas, and these qualities are translated into a variety of policy instruments at the national and local levels.
- (2) Solid institutional support is required by eradicating sectoral egos with governance mechanisms such as the division of authority and coordination mechanisms between parties to ensure synergy and synchronization in a pandemic circumstance where the state needs a sizable budget while state revenues are decreasing.
- (3) The government will need to invest a significant amount of money in green economic transformation in order to help the fight against climate change and make new, labor-intensive discoveries. Numerous stakeholders, including the business sector and the global community, must invest their money. A sustainable environment is the biggest investment for future generations.
- (4) Because the development of a green industry to manufacture environmentally friendly goods necessitates needs the support of new technologies, the shift to a green economy is time-consuming and expensive. Since green products are always more expensive than conventional ones, this can be stopped if there are incentives for buying them.
- (5) Because there is a tendency of the increase in corruption crimes, strict rules and law enforcement are required to supervise pro-environmental initiatives.

Improved regulatory and law enforcement practices, coordination amongst concerned stakeholders, and community participation are the cornerstones of attempts to remove barriers to green economy policies. This is done by raising citizens’ awareness of the green economy, a new economic paradigm that aims to reduce environmental harm and promote sustainable development.

A. Realizing a Green Economy: Forestry Digital Transformation Policies

a. Understanding and constraints of digital transformation

Digitalization is the changes that digital technology causes or influences in all aspects of human life.³⁴ The application of digital technology to all facets of societal life is undergoing a change known as “digital transformation,” which is a component of a bigger technological process. Digital transformation has changed many facets of human life over the history of the species. The advancement of digital technology will continue. Future technological advancements will be impacted by three factors: network convergence, digital

34 Erik Stolterman and Anna Croon Fors (2004), “Information Technology and The Good Life,” p.1, in Bonnie Kaplan (2004), *Information System Research, Relevant Theory and Informed Practice*, New York: Kluwer Academic Publishers.

infrastructure, and digital transition.³⁵ The five main barriers in implementing digital transformation, according to a study by Microsoft entitled “Microsoft Digital Transformation Study,” are as follows:³⁶

(1) Cyberthreats and Data Security in Indonesia

Many Indonesian businesses do not currently take cybersecurity very seriously. Despite this, the National Cyber and Crypto Agency (BSSN) reports that there was a roughly 4-fold rise in cyberattacks in 2020 compared to the year before. Since the pandemic led to changes in people’s lifestyles that are more dependent on digital technology, cyber security must be the top priority for businesses that are presently undergoing or plan to undergo digital transformation. Utilizing the reputable and trustworthy data security services and tools are the ways to increase cyber security without needing to make significant expenses.

(2) The shortage of Digital Expertise in Indonesian Human Resources

The Workday Digital Agility Index indicates that 68% of ASEAN organizations lack a solid understanding of digital technology. These businesses assert that more than 50% of their staff members lack strong digital capabilities. According to Workday’s research findings, most ASEAN organizations did not view their human resources as a source of competitive advantage, thus they did not make further efforts to properly hire and develop their people resources. This mindset is what caused a lack of digital knowledge.

(3) Lack of the appropriate technology partner.

A company needs assistance from outside businesses in addition to internal digitization to successfully switch to the digital world. Moreover, establishing technological alliances can assist businesses in achieving cost savings for additional expenditures. Therefore, the businesses owners must pick the best technology partner to support and accelerate their growth in this digital era.

(4) The Uncertainty of Economic Environment

As reported by the Central Bureau of Statistics in Q3 2020, COVID-19 caused the Indonesian economy to experience its first recession in 22 years. The Institute of Chartered Accountants in England and Wales (ICAEW) had a conversation with business professionals, and they claimed that digital infrastructure is the secret of surviving the recession. Mark Billington, ICAEW Regional Director for Greater China and Southeast Asia states that Businesses and organizations must be able to adapt to the current environment, where the adoption of technology as a daily necessity occurs so quickly, in order to continue to grow and operate in this new normal era.

(5) Government Policy & Information and Communication Technology Infrastructure

The National Information and Communication Technology Council advises Indonesia to concentrate on implementing five measures to quicken the process of digital transformation:

- i. Support strategy with rules and guidelines.
- ii. Increase human resource capabilities and provide access to future talent and intelligence.
- iii. Develop infrastructure and technological proficiency.
- iv. Use funds and rewards to accelerate activities.
- v. Expand the online ecology.

In order to provide facilities and support digital transformation, the 2020–2024 national medium-term development plan (rpjmn) developed policy directions and strategies, including:³⁷

- i. Developing the capability of Human Resources for Information and Communication Technology in the nation that is on target to meet domestic needs; (a) harmonizing laws and regulations to stimulate the development of the domestic Information and Communication Technology industry; (b) increasing community digital literacy; and (d) establishing business partnerships.

35 N. J. Habraken (2000), *The Structure of the Ordinary Form and Control in the Built Environment*, p.1, Massachusetts: The MIT Press.

36 Tsel Enterprise (2021), *5 Hambatan Dalam Menerapkan Transformasi Digital Di Indonesia* (5 Barriers to Implementing Digital Transformation in Indonesia), February 12, 2021; available at: <https://id.linkedin.com/>, 2021, <https://id.linkedin.com/pulse/5-hambatan-dalam-menerapkan-transformasi-digital-di-tsel-mybusiness> (accessed on March 12, 2023).

37 Nurcholis Ramlan (2022), *Arah Kebijakan Transformasi Digital Dalam RPJMN 2020-2024* (Digital Transformation Policy Direction in the National Medium Term Development Plan 2020-2024), February 1, 2022; available at: <https://mubalighteknologi.co.id/arah-kebijakan-transformasi-digital-dalam-rpjmn-2020-2024/> (accessed on March 12, 2023).

- ii. Adoption of cross-sectoral, global technology (Big Data, IoT, AI, etc.) in the planning, monitoring, and implementation of performance by (a) promoting the use of a single data set in the context of using data that is interoperable, standardized, and can be shared; (b) supporting the use of Big Data analysis to increase the accuracy of planning, the performance of development implementation, and the accuracy of development supervision; (c) encouraging the creation of a national data dashboard to support accessible, standardized, and shared data-based policy and decision-making.

In the meantime, mainstreaming digital transformation is an effort to maximize the contribution of digital technology to raise the competitiveness of the country and as a source of future economic growth for Indonesia. The stabilization of the ecosystem (supply), use (demand), and management of big data are components of the mainstreaming approach for digital transformation.

a. Digital transformation policies in Forestry

Digital transformation, health architecture, and energy transition were the three strategic topics that received the most attention at the G20 Summit. These three variables affect how the Indonesian forestry sector is put into action. After Indonesia's presidency in the G20, the forestry sector has the opportunity to transform policies related to its revenue contribution which is only able to support less than 1% of national income. Approximately 66% of Indonesia's geographical area is covered by forests, so such number is a relatively low percentage for the third-largest tropical forest in the world. This calls for a quantum leap in management innovation to make forest management more efficient and effective.³⁸

To achieve its aim, Indonesia Digital sets out six strategic directions. The six directions are intended to lead Indonesia as a nation with a high level of digital literacy, enthusiasm for the future, and an innovation-based economy with cutting-edge technology skills. The six strategic directions mentioned are as follows:³⁹

- i. Establishing high-quality, secure, and dependable infrastructure and connectivity;
- ii. Transforming Indonesia from a consumer to a producer of technology through investment in a number of platforms with strategic national significance, such as data centers, cloud infrastructure, and a national digital identity;
- iii. Enhancing digital capabilities in priority sectors to boost geostrategic competitiveness and promote inclusive growth;
- iv. Establishing open, integrated, and digital government institutions to enhance public services;
- v. Promoting a digital culture and utilizing the demographic dividend by empowering Indonesians to shape the digital world; and
- vi. Harmonizing regulations and increasing funding to promote innovation.

The involvement of all societal levels, pertinent ministries/agencies, and the central government as a whole is required to support the realization of four digitalization projects in order to achieve this national digital transformation. Infrastructure development for information and communication technologies must be updated to keep up with societal demands and technological advancements. Additionally, information and communication technology infrastructure need to be expanded to reach all regions and all demographic groups in order to promote basic services and boost socioeconomic activity. Expanding fixed and mobile broadband networks, creating a program to provide nationwide broadband access, especially in non-commercial regions, and providing BTS and internet access are all necessary for improving the dependability and speed of information services. The Palapa Ring is being built as a national backbone network.

In today's world, including the forestry industry, digital technology has taken on significant importance. Technology has helped bring about change, enabling more efficient and effective forest governance. Previously, the forestry industry was frequently seen as a field deficient in innovation. The most significant game changers

38 Ishak Tan (2022), *G20 Dan Peluang Transformasi Penyelenggaraan Kehutanan* (G20 and Opportunities for Transforming Forestry Administration), December 5, 2022; available at: <https://pewartasatu.com/g20-dan-peluang-transformasi-penyelenggaraan-kehutanan/> (accessed on January 13, 2023).

39 Ministry of Communication and Information of Republik Indonesia (2021), *Regulation of the Minister of Communication and Informatics Concerning the Strategic Plan of the Ministry of Communication and Informatics for 2020-2024*, available at: <https://peraturan.bpk.go.id/Home/Details/169164/permenkominfo-no-nomor-2-tahun-2021-tahun-2022> (accessed on January 20, 2023).

in forestry science and technology are innovation in the forestry sector and digitalization, according to the study Digital Transformation Supports Forestry Innovation 4.0 for a Green Economy and Saves the Earth.⁴⁰ The stabilization (supply), exploitation (demand), and big data management of ecosystems are components of the plan for mainstreaming digital transformation in forestry. Mega-disruptions brought on by digitalization will affect the political, social, environmental, and economic spheres in both positive and harmful ways.

In order to implement digitally based planning and data gathering, more precise management, and monitoring, and to boost the effectiveness of forest management activities, especially for production activities, technology 4.0 is utilized as an accelerator in the management of forests. To promote forestry 4.0 in a comprehensive and integrated way, it is essential that government, non-government organizations, the community, the commercial sector, and development partners be involved.

Technology-based policy innovations are needed for forest management activities in order to help address the present issues with forest governance. Also, data covering a large geographic region, integrated at all levels of management, and need to be accessible quickly are needed for forest management activities. In order to enable more effective forest management through reliable data that can aid in understanding the phenomena that occur, digital tools are required. Indonesia has completed two phases in order to reach the goal of forestry 4.0, including;

- i. The first stage entails determining the technology potential and forestry industry demands, as well as creating a roadmap.
- ii. The progressive dissemination of research findings and contributions to forest preservation are part of the second phase of implementing forestry resource development 4.0, which is concerned with technology, infrastructure, and human resources.⁴¹

To combat climate change and promote a green economy, forestry development should be built on Industry 4.0. Given Indonesia's existing competitive advantage, the site level work has been strengthened through digital transformation. The Forest Product Administration Information System (SIPUHH), the On-Line Non-Tax State Revenue System (SIMPONI), and the Timber Legality Information System (SILK) are just a few of the innovative digital application-based information service systems that the government, the Ministry of Environment and Forestry, has created thus far. A Forestry Multi-Enterprise Policy has also been published, allowing the integration of multiple economic ventures into a single forest use permit (PBPH). With the publication of Minister of Environment and Forestry Decree No. 98 of 2022 regarding FOLU Net Sink 2030 as a follow-up to Presidential Decree No. 98 of 2021, the forest sector and other land uses have made progress. Moreover, the LTS - LCCR 2050 document and the updated NDC document.⁴²

Finding a policy combination that allows economy to fully capitalize on the advantages of a more digitally advanced global economy while also effectively addressing the underlying difficulties is the task faced by policymakers.⁴³ Only a well-thought-out policy strategy will have the potential to fully capitalize on the advantages of digital transformation for greater and more inclusive growth. New technologies like the Internet of Things and artificial intelligence can be extensively utilized when these shifts take place. This forestry digital transformation was created to offer a fresh perspective on how it affects forest management, including putting forest regeneration and rehabilitation into practice, extracting forest products, regulating forest fires, and caring for the community.

40 Robert Nasi (2022), *Kehutanan 4.0: Inovasi Teknologi Pada Sektor Kehutanan* (Forestry 4.0: Technological Innovation in the Forestry Sector), March 29, 2022; available at: <https://forestsnews.cifor.org/76453/kehutanan-4-0-inovasi-teknologi-pada-sektor-kehutanan?fnl=id> (accessed on January 12, 2023).

41 Arifin Rudiyanto (2022), *Digital Transformation Supports Sustainable Forest Management*, March 24, 2022; available at: <https://kalsel.antaranews.com/berita/319497/digital-transformation-supports-sustainable-forest-management> (accessed on January 23, 2023).

42 Bambang Hendroyono (2022), *Transformasi Digital Mendukung Inovasi Kehutanan 4.0 Untuk Ekonomi Hijau Dan Penyelamatan Bumi* (Digital Transformation Supports Forestry Innovation 4.0 for the Green Economy and Saving the Earth), March 25, 2022; available at: <http://ppid.menlhk.go.id/berita/siaran-pers/6479/transformasi-digital-mendukung-inovasi-kehutanan-40-untuk-ekonomi-hijau-dan-penyelamatan-bumi> (accessed on March 12, 2023).

43 Etty Indriani et al. (2020), "Model of Development and Sustainability of Community Empowerment Trust Fund Management – Based on Institutional Economy," *Journal of Southwest Jiaotong University*, vol. 55, no. 5, at p. 1–11; available at: <https://doi.org/10.35741/issn.0258-2724.55.5.18> (accessed on February 10, 2023).

The forestry industry has identified a number of demands that must be satisfied in order to move toward the digital transformation of forestry 4.0, in addition to the specific budget, including: rules and regulations, institutions, human resources, standardization, infrastructure, and the accumulation of technological breakthroughs. A significant priority for the digital transformation of forestry is the necessity for regulation. Regulations have a significant impact on how different stakeholders participating in digital transformation-based forest management interact with one another. Regulation also serves as a fundamental tool that must be used before a number of other requirements are met.⁴⁴

An instrumental theory approach and a substantive theory approach can be employed in the establishment of laws and regulations regarding the digital transformation of forestry. By applying the two theories through two (two) stages of analysis, the following framework can be utilized by policy makers to create regulations. Substantive theory and instrumental theory each have advantages and disadvantages that are unique to them. First, policy and regulatory officials must decide whether the advancement of a technology has harmed or disrupted the interests or principles covered by pre-existing law. What is meant by current interests or values, such as legal certainty and justice in the administration of forest exploitation between holders of forestry permits and local and traditional populations. It is accomplished by:⁴⁵

- i. Identify the interests impacted by advancements in digital transformation technology for the forestry industry;
- ii. Determine whether advancements in forestry digital transformation technology have actually disrupted these interests.

In this phase, instrumental theory is applied with a “backward-looking” approach, evaluating if the current legal framework is adequate for accommodating technological advancements. Policy makers do not need to create new policies or laws in response to technological advancements if they consider, based on the findings of the aforementioned study, that the interests or values protected by current laws are not disturbed. However, if the policy-maker’s observation reveals that the intended interest has been compromised as a result of technological advancement, policy and policy makers must proceed to the following second stage:

- i. Carefully evaluate the extent of evolving technology and the potential effects it may have on already legally protected interests or values; consequences that may develop include both those that technology creators have foreseen and those that they have not.
- ii. Establish rules or guidelines to safeguard beliefs or interests while attempting to be as compliant with the law as feasible.

Second, because substantive theory is applied in a future-oriented manner, new rules and regulations must be made to safeguard interests that are endangered by technology advancements. Regulations are developed carefully by taking into account the following factors: (1) advancing technology; (2) current laws; (3) interests or values that have been and will be safeguarded; and (4) the essential law.

Digitalization of forestry 4.0 must be focused on promoting a green economy, supporting robust economic growth, being environment friendly, providing jobs and income, eliminating poverty, and being socially inclusive as the opposite of traditional development models that rely on resource exploitation. In order to survive the climate catastrophe and avoid the middle-income trap, Indonesia’s government and people have committed to achieve Indonesia Gold 2045 and Net Zero Emissions 2060 or earlier.⁴⁶

44 Dadang Jainal Mutaqin, Muhamad Nafi Adriansyah, and Nur Hygiawati Rahayu (2021), “Penerapan Teknologi Informasi Dan Komunikasi Dalam Bidang Kehutanan Menuju Kehutanan 4.0.” (Application of Information and Communication Technology in the Forestry Sector Towards Forestry 4.0), *Bappenas Working Papers* vol. 4, no. 2, at p. 218–238.

45 Arthur Cockfield and Jason Pridmore (2007), “A Synthetic Theory of Law and Technology,” *Minnesota Journal of Law, Science & Technology*, vol. 8, no. 2, at p. 474–513; available at: <https://scholarship.law.umn.edu/cgi/viewcontent.cgi?article=1258&context=mjlst>. (accessed on April 3, 2023).

46 Bambang Hendroyono (2022), *Transformasi Digital Mendukung Inovasi Kehutanan 4.0 Untuk Ekonomi Hijau Dan Penyelamatan Bumi* (Digital Transformation Supports Forestry Innovation 4.0 for the Green Economy and Saving the Earth), March 25, 2022; available at: <http://ppid.menlhk.go.id/berita/siaran-pers/6479/transformasi-digital-mendukung-inovasi-kehutanan-40-untuk-ekonomi-hijau-dan-penyelamatan-bumi> (accessed on March 12, 2023).

For the fulfillment of a sustainable environment to prevent forest and environmental damage due to poor management in the context of development, the management of forestry natural resources and the environment is inextricably linked to the effect of legislative and political factors. The main issue with regulatory structure is a matter of paradigm in the legal reform agenda, where the constitution requires us to focus on just legal politics. High-level political commitment and leadership, both nationally and regionally, backed by the larger community, are essential to realize a green economy and attain green economic growth.

5. Conclusion

In order to achieve a green economy in forestry, it is necessary to conduct research on the global issues of climate change, particularly with regard to the policy aspects that aim at optimizing sustainable forest management by using forestry technology as an accelerator in managing forests and realizing planning and digital-based data capture, more precise management, and monitoring. This method improves the efficiency of forest management activities and lessens harm to forests and their ecosystems, both of which contribute to the planet's preservation. In order to achieve sustainable development, another crucial policy relevant aspect would be the inclusion of community participation (local and customary) as well as transparency of environmental and forest management through a holistic, comprehensive, and interdisciplinary approaches.

As the antithesis of traditional development models that rely on the exploitation of natural resources, digital transformation of forestry must be focused on supporting a green economy, which is directed toward strong economic growth, being environmentally friendly, creating jobs and income, reducing poverty, and being socially inclusive. In order to withstand the global climate crisis and avoid falling into the middle-income trap, the Indonesian people and the government need to be committed to earn Indonesia Gold 2045 and Net Zero Emissions 2060 at the earliest.