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Research Article

Addressing the Global Deforestation Problem through the EU Deforestation Regulation and Producing Countries' Adaptation Processes

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Abstract: The European Union's awareness of the importance of forest protection and conservation has led to the European Union Deforestation Regulation (EUDR), which strictly regulates trade in commodities and products that contribute significantly to deforestation and forest degradation. In response to the establishment of this regulation, objections were raised by producer countries of related commodities and products, including Brazil, Ghana, and Indonesia. Therefore, this study will examine the responses and adaptation processes of Brazil, Ghana, and Indonesia to the implementation of the EUDR and analyze the handling of global deforestation through the EUDR from the perspective of Robyn Eckersley's green theory. This study employs a descriptive qualitative approach, utilizing data collection techniques through a literature review of various relevant studies. PEST analysis is used to review the political, economic, social, and technological impacts of the EUDR on producing countries. The results show that Brazil, Ghana, and Indonesia have adopted national approaches in preparing for EUDR implementation. The establishment of the EUDR is a commendable innovation in minimizing environmental damage through binding regulations; however, it is insufficient in reducing global deforestation rates, as these regulations only control access to the European Union market. Examining the EUDR from the perspective of green theory reveals that these regulations remain predominantly human-centric, and their formation process is not ideal based on the fundamental aspects outlined in green theory. Reviewing the impact of the EUDR on political, economic, social, and technological aspects in producer countries underscores the need for EU support for these countries, given the various challenges they face in the adaptation process, even though this regulation encourages more sustainable agricultural practices.

Keywords: Deforestation; Green Theory; PEST Analysis; Producing Countries; Trade Regulations

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1. Introduction

Forests are beneficial to living things on earth by helping to protect the climate, providing clean air through the oxygen they release, purifying water and soil, and storing water reserves. The loss of forests will have an impact on the condition of the earth, one of which is by increasing and even worsening the greenhouse effect. Excessive greenhouse gas emissions can lead to global temperature rises, increased annual rainfall intensity, threats to food security due to climate change, rising sea levels, higher sea temperatures that impact marine life and coral reefs, and the spread of diseases through water (Wahyuni & Suranto, 2021). The conversion of forest land into agricultural and livestock land, as well as infrastructure development, is known as deforestation. It is estimated that global deforestation accounts for 12 to 20 percent of total greenhouse gas emissions, thereby exacerbating climate change (Besliu, 2024). According to the latest FRA-FAO report, the annual deforestation rate is estimated to have reached 10 million hectares over the five years from 2015 to 2020 (FAO, 2018). The latest data from the Forest Declaration indicates that the world lost at least 5.4 million hectares (Mha) of forest permanently in 2023, with higher

results when combined with deforestation caused by fires, totaling 6.4 million hectares (Mha) (Forest Declarations Assessment, 2023).

Environmental issues, including deforestation, are being seriously addressed by the European Union. Europe has established the European Union Deforestation Regulation (EUDR) to reduce deforestation and forest degradation by strictly monitoring commodities that significantly contribute to deforestation entering the EU market (EUDR, 2023). Trade restrictions on certain agricultural commodities have been tightened, as most deforestation is caused by the conversion of forest land into agricultural land. Moreover, EU consumer demand is one of the main drivers of deforestation and forest degradation on a global scale (EUDR, 2023). Trade imports to the EU are responsible for approximately one-tenth, or 1 million hectares, of global deforestation per year related to the production of goods or the provision of services (Winter et al., 2024; GWMI, 2023, as cited in Dovecar & Ščap, 2023). Several commodities are considered to have a significant impact on deforestation rates, including palm oil, soybeans, timber, cocoa, coffee, beef, and rubber (EUDR, 2023). This regulation applies not only to the seven raw commodities listed in the EUDR but also to their derivatives, such as chocolate, butter, cocoa powder, mixed-rubber, rubber tires, soybean flour, soybean oil, solid wood, wood powder, printed paper, palm oil, offal, cowhide, and other products. This regulation replaces the European Union Timber Regulation (EUTR), which has been in place since 2013, focusing on timber and its derivatives (Winter et al., 2024).

The EUDR is the result of a combination of initiatives and objectives previously established by the European Union to address the global environmental crisis, including efforts to tackle deforestation. The EUDR aims to promote more sustainable production and international trade methods (Grabbe & Moffat, 2024). It applies not only to trade between countries within the European Union but also to commodity-producing countries outside the European Union. Some of the largest exporters of products listed in the EUDR include Brazil, with soybeans as its primary agricultural export commodity (Søndergaard & Dias De Sá, 2023; OECa, 2023); Ghana, with cocoa (OECb, 2023); and Indonesia, with palm oil (Rasbin, 2023). Brazil, Ghana, and Indonesia benefit significantly from the exports of commodities and related products, which significantly contribute to each country's export figures. However, on the other hand, the economic benefits from agricultural production in these three countries influence the increase in deforestation rates. According to data from the World Resources Institute, Brazil and Indonesia are the top two countries experiencing the most significant loss of primary forests globally between 2002 and 2023 (Mikaela & Goldman, 2024). For Ghana, although its cocoa exports are not as large as those of the Ivory Coast, between 2020 and 2023, Ghana lost 35,000 hectares of primary forest, equivalent to 35,000 hectares, exceeding the Ivory Coast (Global Forest Watch, 2023b).

The EUDR has received a variety of responses from various parties, particularly from countries that produce the products listed in the annex, whose most significant export market is the European Union, following the announcement of its implementation (Besliu, 2023). On September 7, 2023, 17 countries submitted letters of objection to the implementation of the EUDR regulation, including Brazil, Ghana, and Indonesia (Ministry of Coordinating Economic Affairs of the Republic of Indonesia, 2024; Besliu, 2024). In response to the global request for a delay, the EUDR was ultimately postponed by the European Union and will now take effect on December 30, 2025, for large companies and on June 30, 2026, for micro-enterprises (European Commission, 2024). There are two tendencies in the responses of producer countries: on the one hand, some have objected and even requested a postponement of the EUDR, while on the other hand, others have objected but are cooperatively working towards adaptation. The motivation behind establishing the EUDR for forest protection is on the right track. However, each producer country is in a different situation and condition in terms of adapting to this regulation. The diverse conditions and capacities of producer countries mean that each country requires a different adaptation period.

Therefore, an in-depth study will be conducted on the EUDR mechanism and its impact on producer countries. The theoretical framework for this study draws on Eckersley's (2013) green theory, which emphasizes the need to minimize various forms of environmental damage and prevent the negative impacts of environmental activities on parties not directly involved, including living creatures in other regions and future generations. Based on this background, this study will further explore how producer countries respond and adapt to the implementation of the EUDR regulation by selecting Brazil, Ghana, and Indonesia as comparators. Additionally, this study will analyze the impact of the European Union Deforestation Regulation (EUDR) on addressing global deforestation issues from the

perspective of green theory, examining it through political, economic, social, and technological (PEST) aspects, particularly affecting producer countries.

2. Literature Review

Theoretical Study

Green Theory

The emergence of environmental issues in the 1970s prompted the study of environmental issues in international relations, particularly in the context of international environmental cooperation. Green theory emerged in the discipline of international relations by criticizing the approaches of neorealism and neoliberalism. Green theory refers to, revises, and expands international political economy, drawing on neo-Marxism and cosmopolitan-oriented normative international relations theory. The primary objective of green theory is to minimize various forms of environmental damage and prevent the negative impacts of environmental activities on non-participating parties, including living beings in other regions and future generations. Green theory is divided into two branches, both of which condemn environmental injustice, although they have different tendencies. The normative green approach focuses more on how states and state systems can be more responsive to environmental issues.

Meanwhile, the political economy approach is more opposed to the role of the state. This shows that there are differences in understanding among green political theorists. The normative approach states that the state is the superior institution with the capacity to direct and legitimize what is necessary for implementing ecological constraints on capitalism. On the other hand, a green political economy sees the dynamics of global capitalism as the leading cause of environmental damage (Eckersley, 2013).

Previous Research

Four previous studies serve as references in this study. First, a study conducted by KAKIŞIM, C. (2022) in his paper entitled "The European Green Deal: An Analysis from a Green Theory Perspective" explains the relationship between the European Green Deal, designed by the European Commission and Green theory. This study suggests that the European Union's efforts to create a new green economy and ecological democracy model for other countries from a green theory perspective could open opportunities for the European Union to maintain its transformative political power and produce global norms. The author will use this study as a reference in examining regulations from a green theory perspective.

Second, a study conducted by Grabbe H. et al. (2024) in their paper titled "Extra Time For Deforestation: Lessons For Future EU Environmental Legislation" explains the protests and impacts of the EUDR regulation that triggered its implementation delay. This study highlights the importance of developing consistent and effective strategies for shaping regulations and leveraging the experience gained from the EUDR's formation to better prepare for the implementation of future regulations. The second study, which serves as a reference for this study, provides recommendations to the European Union as the regulator of the EUDR.

Third, the study conducted by Lopes et al. (2023) in their paper titled "Brazilian Environmental Policies and the New European Union Deforestation-Free Products: Opportunities and Challenges" explains how Brazilian environmental regulations interact with European Union regulations for deforestation-free products and identifies the opportunities and challenges of these regulations for Brazil. This third study serves as a reference for developing the discussion by comparing two other producer countries' preparations for implementing the EUDR and the challenges they face.

Fourth, the study conducted by Afandi et al. (2024) in their paper "Indonesia's Plantation Strategy in Responding to the European Union's Deforestation-Free Regulation (EUDR)" explains various aspects related to the EUDR and the strategies that should be adopted to take advantage of the opportunities offered by the EUDR. This fourth study serves as a comparative reference regarding the preparations of two other producer countries in implementing the EUDR.

3. Proposed Method

This study will use a descriptive qualitative approach. Referring to Bogdan and Taylor, as cited in Abdussamad (2021), qualitative research is a type of research that produces descriptive data in the form of written words and is oriented toward natural phenomena or symptoms (Abdussamad, 2021). In this study, data will be collected through a comprehensive literature review encompassing books, scientific journals, and published data. The data will be analyzed using the PEST analysis tool. PEST is a macroeconomic external environment analysis tool that aims to enhance decision-making processes by considering various aspects, including political, economic, social, and technological factors that surround an issue (Valencia et al., 2018). In this study, a PEST analysis is employed to examine the impact of the European Union Deforestation Regulation (EUDR) on addressing global deforestation issues, reviewed through the political, economic, social, and technological aspects in producer countries.

4. Results and Discussion

European Union Deforestation Regulation (EUDR)

The European Union Deforestation Regulation (EUDR) is a European Union regulation that regulates trade in commodities contributing to global deforestation and forest degradation by imposing specific terms and conditions on the entry and exit of commodities listed therein. The EUDR has been adopted into EU Regulation 2023/1115, which entered into force on May 31, 2023 (Regulation (EU) 2023/1115 [EUDR], 2023). According to the latest information, the EU has postponed the implementation of this regulation for operators and traders marketing commodities or products to the EU, which will now take effect on December 30, 2025, for medium and large operators and traders, and June 30, 2026, for micro and small businesses (European Union, 2024). The EUDR is an extension of the European Union Timber Regulation (EUTR), which aims to minimize deforestation and forest degradation by imposing strict regulations on timber commodities and their derivatives marketed within the EU. The EUTR was adopted in EU Regulation No. 995/2010. It is known that in 2021, the European Commission conducted a functional evaluation of the EUTR to assess whether it was achieving its objectives, with results indicating that the objectives of this instrument had not been fully met. The results of this evaluation were one of the reasons for the repeal of the EUTR and its replacement with the more comprehensive and expanded EUDR.

The EUDR aims to prevent European Union residents from purchasing, using, or consuming products that contribute to deforestation and forest degradation on a global scale. The objective of the initiative is to reduce the global carbon emissions generated by the production and consumption of commodities that yield approximately 32 million metric tons of carbon emissions annually. The regulation defines deforestation as the conversion of forest land into agricultural or livestock land. Conversely, the conversion of forests to other uses, such as infrastructure development, is not classified as deforestation. To be marketed within the European Union, products must be deforestation-free, produced by the regulations in force in the country of origin, and undergo due diligence. The term "deforestation-free" indicates that the relevant products are neither derived from nor fed on land that has been deforested after December 31, 2020 (EUDR, 2023).

The rules referred to regarding products manufactured following relevant and applicable laws and regulations in the country of production include 1) land use rights, 2) environmental protection, 3) forestry regulations such as forest management and biodiversity conservation (if the product is directly related to deforestation), 4) third-party rights, 5) labor rights, 6) human rights based on international law, 7) the principle of free, prior, and informed consent (including the UN Declaration on the Rights of Indigenous Peoples), and 8) taxes, anti-corruption, trade, and customs regulations (EUDR, 2023, Art. 2). There are two entities classified under this regulation: operators and traders. Operators are the first parties to place commodities and products in the European Union, while traders are the parties that distribute or sell relevant commodities and products within the European Union market. Other requirements, such as due diligence, must be fulfilled by the operator before products are marketed in the European Union. The three components of due diligence are information requirements, risk assessment, and risk mitigation.

Information requirements require operators to collect information, data, and documents, including product descriptions, quantities, country of origin, geolocation (simple information for land areas under 4 hectares and polygons for areas over 4 hectares), detailed information

about suppliers, proof of verified deforestation-free products and proof of verified product legality in accordance with applicable laws and regulations in the country where the product is produced (EUDR, 2023, Art. 9). Risk assessment is required to be carried out by operators taking into account several factors, such as 1) the risk level of the country of production (including the presence of forests, deforestation rates, and risks based on legal and social factors), 2) indigenous communities (including the presence of indigenous communities, cooperation between operators and indigenous communities (if there is a link between indigenous communities and the production process), 3) the complexity of the supply chain and the processing stages of the relevant products, 4) the risk of non-compliance with regulations (e.g., relevant products whose production process is mixed with materials of unknown origin or relevant products produced from areas that have been or are currently undergoing deforestation), 5) product documentation and information (including the validity of information and documentation, product non-compliance risk information, and supplementary compliance information such as certification) (EUDR, 2023, Art. 10). Risk mitigation is the next mandatory step if the risk assessment results indicate significant non-compliance or the presence of risks that cannot be ignored. Risk mitigation is carried out through the addition of information, data, or documents, conducting self-audits, and taking other actions related to information requirements by the information requirements. Furthermore, operators are required to establish policies, controls, and procedures to reduce the risk of non-compliance (EUDR, 2023, Art. 11).

Each country producing products covered by the EUDR will be categorized into three levels of risk of deforestation and forest degradation: high risk, standard risk, and low risk. These categories aim to provide slightly more lenient treatment to countries at the lowest level and stricter treatment to countries with higher levels of risk. The risk level classification takes into account the country's involvement in deforestation and the extent of its contribution to forest cover loss, the rate of expansion of agricultural land for covered commodities, and production trends for covered commodities (EUDR, 2023, Art. 29). Penalties are established for violations committed by operators and traders.

The maximum fine is set at a minimum of 4% of the operator's or trader's annual turnover across the entire European Union. Sanctions may also include the seizure of commodities or related products from operators or traders, the confiscation of proceeds from transactions involving commodities or related products, a temporary ban on placing commodities or products on the market, and a prohibition on conducting simplified due diligence (EUDR, 2023, Art. 29).

Response and Adaptation Process of Producing Countries

Brazil, Ghana, and Indonesia are among the countries requesting a postponement of the EUDR. This can be seen from two letters sent by producer countries to the European Union authorities. On July 27, 2022, a letter was sent to the European Union authorities signed by 14 countries, including Brazil, Ghana, and Indonesia. The letter expressed objections to the implementation of the EUDR by like-minded countries (Ministry of Coordinating Economic Affairs of the Republic of Indonesia, 2024). On September 7, 2023, a second letter was sent to the central EU authorities. This letter was signed by 17 countries, including Brazil, Argentina, Bolivia, Colombia, Côte d'Ivoire, Ecuador, Ghana, Guatemala, Honduras, Indonesia, Malaysia, Mexico, Nigeria, Paraguay, Peru, the Dominican Republic, and Thailand (Joint Letter, 2023). The second letter stated that the EUDR disregarded the laws and certification mechanisms in place in producer countries, as well as their efforts and commitments in multilateral efforts to combat deforestation. The letter urged the EU to engage in dialogue with producer countries to at least revise the law or reduce the negative impacts of the EUDR's implementation by recognizing local sustainable agricultural practices. This is because the approach taken by the EU is considered inflexible, disregards local conditions, and imposes significant costs. The letter also states that the EUDR does not have a positive impact on deforestation rates and will instead have negative consequences. Exceptional support should be provided to small producers, given the challenges they will face. The letter urges the European Commission to be more precise and more detailed in formulating the implementation and guidelines of the EUDR, which includes different compliance requirements and due diligence regimes for commodities and products from small producers (Joint Letter, 2023). Although the three countries are among those requesting a delay, there are differences among them in their preparations for adapting to the EUDR.

Brazil

Brazil is a country located in South America, characterized by a tropical climate. According to OEC data, in 2023, Brazil exported soybeans worth $2.56 billion and coffee worth $1.03 billion (OEC, 2023). In addition to these two major commodities, Brazil also exports other commodities, including timber and cellulose, palm oil, beef, cocoa, and rubber (Confederação Nacional da Indústria, 2023). According to Mapbiomas estimates, the primary driver of deforestation in Brazil is the conversion of forest land into commercial agriculture (Forest Trends, 2022). Brazil is the country in the African region with the highest rate of primary forest loss. According to data from the World Resources Institute, Brazil ranks first among countries experiencing primary forest loss between 2002 and 2023, with a total of 30.7 million hectares (Mha) (Mikaela & Goldman, 2024). According to data from Global Forest Watch, between 2020 and 2023, Brazil lost over 1 Mha of primary forest, equivalent to 1 million hectares per year (Global Forest Watch, 2023a). Recognizing that Brazil's forest area is being gradually eroded by conversion to other land uses, the country has responded by implementing efforts to protect its forests through legal provisions, policies, and programs. This demonstrates how Brazil, as a responsive nation, manages its natural resources to maintain limits on forest exploitation.

However, on the other hand, Brazil has raised objections to the EUDR due to the lack of involvement of producer countries in the formulation of regulations, the impact of the EUDR on Brazil's exports to the European Union, and the disregard of national laws, particularly the Forest Code, which legally allows landowners to convert forest land for agricultural activities within certain limits while maintaining a certain percentage of the original vegetation on each landowner's total land area. The official response from the Brazilian government to the EUDR implementation plan can be seen in a letter signed by Agriculture Minister Carlos Fávaro and Foreign Minister Mauro Vieira, stating that the EUDR is a unilateral or one-sided instrument and a punishment for producer countries for disregarding national laws in their efforts to combat deforestation.

This has triggered a reactive response from Brazil in the adaptation process. However, Brazil's efforts in the adaptation process are reflected in the launch of Agro Brasil + Sustentável, which was introduced at the end of 2024. According to a statement by the Deputy Minister of the Brazilian Ministry of Agriculture (MAPA), Agro Brasil + Sustentável is a platform that integrates official government data and information on national agricultural production. The Agro Brasil + Sustentável platform was launched on December 19, 2024, to promote agricultural production that complies with national laws and is verified to apply good agricultural practices with traceability and certification throughout the entire production chain (Ministério da Agricultura e Pecuária, 2024; Presidência da República, 2024). As of the writing of this article, there is no information available on the progress of the platform's implementation, given that the launch of Agro Brasil + Sustentável is still relatively new. From a green theory perspective, Brazil's motivation for adapting to the EUDR remains focused on maintaining Brazil's market access in international markets, particularly in the context of the European Union, which is an important partner for Brazil.

Ghana

Ghana is a country situated in West Africa, characterized by a tropical climate. Ghana is the world's largest producer of cocoa (Kalischek et al., 2023). According to OEC data, in 2023, Ghana exported cocoa beans worth $1.09 billion and cocoa paste worth $440 million (OEC, 2023). Additionally, Ghana exports rubber and palm oil, although not in as large quantities as cocoa. As one of the world's largest cocoa-producing countries, Ghana has a high deforestation rate compared to other agricultural-producing nations in the African region. According to data from Global Forest Watch, Ghana lost over 10,000 hectares of primary forest annually between 2020 and 2023 (Global Forest Watch, 2023b). Among the various drivers of deforestation in Ghana, the primary cause is the expansion of agricultural land.

Ghana previously lacked an effective system to monitor the overall condition of its forests. Historically, there have been efforts to map and monitor forests, although these have been limited and project-based. This was due to a lack of funding that hindered the establishment of a national system for overall forest monitoring (European Forest Institute, 2024b). Ghana is among the countries that have given greater attention to meeting the European Union's EUDR regulations. Given that cocoa is Ghana's primary agricultural commodity, the Ghanaian government has focused its efforts on adapting to the EUDR

regulations for cocoa. As the European Union is Ghana's key partner for cocoa exports, Ghana has no other option but to comply.

At a workshop held between Ghanaian stakeholders and a European Union delegation, discussions focused on preparations for implementing the EUDR in the cocoa sector. Through the Ghanaian delegation, the Ghana Cocoa Board (COCOBOD) reported on Ghana's progress in preparing to meet EUDR requirements. It is understood that COCOBOD is a semi-autonomous body that manages the cocoa industry in Ghana under the supervision of the Ministry of Food and Agriculture and is directly accountable to the Ghanaian government through the Ministry of Finance and Economic Planning. The Ghana Cocoa Traceability System (GCTS) was established to meet EUDR requirements for complete traceability from the point of origin in agriculture to the point of export, including geographical location data where cocoa commodities are produced, recording all cocoa transaction activities, and ensuring that the data is real-time and direct (European Forest Institute, 2024b). According to data published by the European Forest Institute, based on Cacao Insight, COCOBOD has successfully registered 792,054 farmers in cocoa-producing regions, covering a total of 1,239,169 cocoa farms spanning an area of 1,373,756 hectares (European Forest Institute, 2024b). The GCTS is considered strong enough to meet all international regulations that are aligned and relevant to the EUDR (European Forest Institute, 2024b).

In addition to the GCTS, COCOBOD is developing a Deforestation Risk Module (DRM) with technical support from the European Forest Institute (EFI). The DRM was established to link supply chain data with land cover and protected area information. The DRM will monitor the risk of non-compliance with the EUDR, including classifying sustainably produced cocoa commodities as low- and medium-risk. The Child Labor Risk Assessment Module was established to meet the EUDR requirement that commodities or products must comply with the laws and regulations in force in the country of production. This model was developed with support from the German International Cooperation (GIZ) through the International Climate Initiative (ICI). Cocoa Monitor, established by COCOBOD, aims to provide a platform for dialogue among various stakeholders and coordination of sustainability projects in Ghana's cocoa industry.

Ghana is better prepared than other countries in addressing the EUDR. From a green theory perspective, Ghana's motivation for adapting to the implementation of the EUDR is still primarily driven by efforts to secure state revenue from agricultural commodity exports, given that the livelihoods of the Ghanaian people are heavily dependent on the agricultural sector. On the other hand, this demonstrates Ghana's awareness of the market demand for environmentally friendly products. By adapting to EUDR policies, Ghana will benefit from improved forest quality, preventing overexploitation, and ensuring that farmers can continue cultivating their agricultural commodities in the long term.

Indonesia

Indonesia is a country situated in Southeast Asia, characterized by a tropical climate. According to the OEC and Trading Economics, Indonesia's most significant agricultural exports, particularly for commodities listed in the EUDR, are palm oil and rubber (OEC, 2023c; Trading Economics, 2023). Although not as significant as palm oil and rubber, Indonesia also produces five other commodities listed in the EUDR. The primary drivers of deforestation in Indonesia are primarily attributed to the conversion of forests into agricultural land and grasslands for livestock farming. According to data from the World Resources Institute, Indonesia ranks second among countries experiencing the highest loss of primary forest between 2002 and 2023, with a loss of 10.5 million hectares (Mha) (Mikaela & Goldman, 2024). According to data from Global Forest Watch, between 2020 and 2023, Indonesia lost over 0.2 Mha of primary forest, equivalent to 200,000 hectares per year (Global Forest Watch, 2023c).

Regardless of Indonesia's forestry and agricultural trade governance, including legal instruments, service systems, and data systems, the Indonesian government has expressed its objection to the establishment of EUDR regulations. According to a statement by the Coordinating Minister for Economic Affairs, Airlangga Hartarto, EUDR will be detrimental to Indonesia if implemented without consideration for adaptation. On another occasion, the Minister of Trade, Zulkifli Hasan, stated that the EUDR is a discriminatory policy that targets Indonesian commodities and products by requiring them to be free from deforestation (Office of the Assistant to the Deputy Cabinet Secretary for State Documents & Translation, 2023).

From a green theory perspective, Indonesia's motivation in adapting to the EUDR is undoubtedly an effort to protect its position as the largest producer of palm oil and other commodities, such as rubber and timber. Indonesia has developed several strategies to adjust to market conditions that are increasingly focused on sustainable agricultural trade, including the establishment of a national commodity traceability tool known as the National Dashboard. This platform includes data collection and management, mapping of farmer traceability registrations, and relevant business-to-business (B2B) schemes in the agricultural sector. Additionally, the National Dashboard supports the collection of export product data, including geolocation coordinates of the land where commodities or products are produced (Afandi et al., 2024).

The National Dashboard will integrate data from SIPERIBUN for large companies and STDB for small farmers. Surat Tanda Daftar Budidaya Elektronik (E-STDB) is a digital system that manages agricultural information and businesses. This system serves as legal administrative evidence to improve crop quality, including farmland location, seed quality, and harvest yields. E-STDB assists in managing product traceability and supporting agricultural product certification (Afandi et al., 2024; Forest Insight, 2024). SIPERIBUN is a reporting and management system for data and information on agricultural business permits in Indonesia, which is mandatory for companies in the agricultural sector in Indonesia to integrate with this system.

European Union Deforestation Regulation from the Perspective of Green Theory and PEST Analysis Review

Green theory is a framework that aims to raise awareness of the need for environmental protection and the implementation of certain restrictions on its use, as well as how environmental protection should be carried out (Eckersley, 2013). In the context of the EUDR, several aspects can be examined to determine whether this regulation genuinely seeks to protect the environment or whether it ultimately prioritizes human interests. The formation of the EUDR can be analyzed through two branches of green theory: the political economy approach and the normative approach.

First, the political economy approach provides a robust critique of an economic system centered on unlimited growth that continually exploits nature, including forests (Eckersley, 2013). The ecological issues addressed in this approach are handled through the establishment of sustainable regulations and policies. This approach acknowledges the need for sustainable growth that avoids environmental damage, particularly deforestation. Examining EUDR regulations from this perspective, we observe the development of environmental norms through the establishment of trade regulations that prioritize forest sustainability, which are enforced for all countries entering the European Union market. However, this is still far from how green theory assesses the ideal environmental regulation.

Considering that the EUDR regulations include objectives that still prioritize human interests, particularly the consumption patterns of European Union citizens. This suggests that the regulation is only pseudo-ecocentric, seemingly making an effort to minimize environmental damage by restricting trade in products that significantly contribute to deforestation. However, it is not sufficient to reduce deforestation rates because it only regulates the consumer side in the EU market without considering the underlying causes of deforestation at the producer-country level. Furthermore, this approach overlooks the unequal power structure dominated by certain actors, which exacerbates inequality. In the context of the EUDR, the EU's power in global dynamics enables it to control the agricultural supply chains of producer countries, particularly developing and poor nations, through the EUDR.

Second, the normative approach emphasizes the importance of environmental justice and ecological democracy globally, transcending national boundaries and encouraging all parties to participate in decision-making to address global environmental issues jointly. However, this approach still views the role of the state as one that is responsible for legitimizing and regulating economic activities to protect the environment and address global environmental justice. In the context of the EUDR, this regulation promotes transparency in the supply chain of agricultural commodities, particularly for the seven listed commodities, to ensure they are produced in an environmentally friendly manner, avoiding deforestation. In the context of the EUDR, the establishment of the EUDR contradicts aspects of this approach, namely ecological democracy and environmental justice. Ecological democracy promotes the involvement of all parties in decision-making; however, the establishment of

the EUDR did not involve producer countries, which is one of the reasons why seventeen producer countries objected to its establishment.

Additionally, regarding environmental justice, it emphasizes the recognition of a broad moral community, participation and consultation in the formulation of environmental policies, a precautionary approach to protect living beings, fair risk sharing through democratic processes, and compensation and restitution for those affected (Eckersley, 2013). In the context of the EUDR, some of the principles emphasized in environmental justice have been addressed, such as considering the transboundary effects of deforestation, making the EUDR applicable to all countries, and requiring due diligence and traceability as efforts to minimize agricultural production that contributes to further forest damage. However, some of the key aspects of environmental justice have been overlooked, as evidenced by the limited participation of producer countries, including Indigenous communities and farmers, in the development of regulations, the compliance burdens imposed on producers, particularly small-scale businesses and farmers, and the absence of compensation and restitution mechanisms within the EUDR framework.

In green theory, the state plays a role as the responsible party for limiting the exploitation of nature through binding regulations, promoting ecological democracy, collaborating with other countries in addressing environmental issues, and conducting reforms in the economic and political systems to balance sustainable development and ecological balance (Eckersley, 2013). In the context of the EUDR, the European Union has fulfilled its role as a government organization by innovating environmental policies through the establishment of binding regulations to tighten trade in products that significantly contribute to deforestation. However, the essence of the EUDR's establishment ultimately remains focused on human interests.

The EUDR does indeed increase transparency in the agricultural supply chains of the seven commodities and their derivatives. However, on the other hand, various possibilities may arise, such as the target markets of producer countries shifting to other regions outside the EU and deforestation continuing. This is known as greenwashing, where the EU creates a green market within its borders but fails to stop deforestation, allowing market shifts to other markets with less stringent mechanisms than those required under the EUDR. Such regulations are indeed necessary, but they are insufficient to reduce deforestation rates in producer countries. The following are the impacts of the establishment of the EUDR in addressing global deforestation issues on economic, social, and technological aspects for the EU and producer countries, which can be outlined as follows:

Political Aspects

The establishment of the EUDR has an impact on the trade situation in Brazil, Ghana, and Indonesia. The terms and conditions set out in the EUDR regulations are only applicable to and must be complied with by producers and traders within the European Union. However, data and information on commodities and their derivatives, whether originating from within or outside the European Union, must be held by operators and traders within the European Union. This requires domestic producers to collect data and information and submit it to a government database, allowing operators in the EU to access it. Given the EU's influence as the largest consumer of several countries, these regulations have been adopted by producer countries in order to protect their respective markets. In this context, Brazil, Ghana, and Indonesia are pursuing adaptation processes through national approaches, including the development of platforms for data integration and the establishment of traceability systems. As previously discussed, the necessity for adaptation conflicts with the principles of ecological democracy. In efforts to reform trade governance, this regulation fails to consider environmental justice and merely restricts market access.

Economic Aspects

Based on statements made by several interested parties from producing countries, the implementation of the EUDR is expected to impact the economic conditions of their countries. The establishment of the EUDR indeed encourages and promotes trade that is free from deforestation. However, the process of adapting to the EUDR imposes significant costs, both for governments in producer countries to adjust their trade systems in line with EUDR requirements and for domestic producers to support the provision of data and information to operators and traders in the EU, such as the costs of agricultural certification and increased production expenses. The costs incurred, particularly for farmers, create an imbalance between large companies and small farmers, as companies have the capital to comply with

regulations. In contrast, small farmers lack the necessary funds. This ecological imbalance will harm producer countries, which must meet various requirements without receiving funding for producers—especially small farmers—during the adaptation process or subsidies for certification costs.

Social Aspect

The existence of binding regulations that must be complied with by all countries exporting the seven commodities or products listed will further promote more sustainable agricultural production and consumption of products that are free from environmental damage, especially deforestation. However, the risk level classification contained in the EUDR has an impact on producing countries. The higher the risk classification assigned to a producer country, the stricter the oversight imposed on that country, which in turn affects the well-being of its population. This is because the livelihoods of producer countries largely depend on the agricultural sector. On the other hand, developed countries, dominated by the industrial and service sectors, are not significantly affected, as they are classified at a low-risk level due to the minimal conversion of forest land for agricultural purposes. Highlighting the aspect of environmental justice, this exacerbates the disparity between poor and developing countries, which are often producers and developed countries, which are often consumers.

Technological Aspects

Due diligence obligations are driving reforms in agricultural trade governance through the use of technology. This technological modernization can facilitate transparency in the agricultural commodity supply chain. However, producer countries face infrastructure challenges due to disparities in access to technology and the Internet. Certain countries and even regions within a country still lack equitable access to technology and the internet, as well as human resources unfamiliar with technology.

5. Conclusions

Conclusions

Countries have a responsibility and play an important role in addressing transnational environmental issues. Awareness of the importance of environmental sustainability is being increasingly promoted, as exemplified by the European Union's establishment of binding regulations through the EUDR. Comparative data shows that Brazil, Ghana, and Indonesia are producer countries that have adopted a national approach to adapting to the EUDR. However, their motivations remain economically driven, particularly to maintain their export markets, rather than a commitment to ecological sustainability, when viewed through the lens of green theory. Among these three countries, Ghana reflects a more prepared adaptation process compared to Brazil and Indonesia. The results indicate that the establishment of the EUDR does not reflect the principles of green theory, such as ecological democracy and environmental justice, as evidenced by the lack of involvement of producer countries and the disregard for domestic conditions of producer countries. The EUDR represents a positive step forward in efforts to minimize environmental damage related to deforestation, but it remains insufficient in reducing global deforestation rates.

The review of the impact of the establishment of the EUDR, as analyzed through PEST, reveals that its establishment has a significant impact on producing countries in terms of political, economic, social, and technological aspects. Politically, the dominance of the European Union in the global economy has led to the European Union's Directives (EUDR) influencing the policies of producing countries, such as the development of various systems to facilitate EUDR compliance. The establishment of the EUDR encourages deforestation-free agricultural practices and trade processes. However, these regulations impose additional costs on producer countries, both governments and producers, particularly small-scale farmers, such as certification costs and increased production costs without financial support from the EU during the adaptation process. The EUDR aims to promote the production of environmentally friendly agricultural products. However, the classification of countries into risk categories may exacerbate inequalities between producer and consumer countries, as producer countries face numerous demands despite contributing only a small portion of greenhouse gas emissions compared to other sectors, such as the energy sector. The EUDR mechanism encourages EU member states and non-EU producer countries to utilize technology for supply chain transparency. However, the challenge in modernizing technology lies in the uneven access to technology and the internet in producer countries.

Suggestions

The European Union, as the initiator of this transnational green trade regulation, needs to carefully consider various factors and impacts that will result from the regulation. In addition, the European Union should provide support to developing countries to mobilize resources for improved environmental governance, offer assistance in the adaptation process or transition to compliance with the EUDR itself, and promote other sustainable practices. The author's recommendations for further research include analyzing the effectiveness of EUDR implementation and its impact on reducing global deforestation rates.

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