INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH AND ANALYSIS

ISSN(print): 2643-9840, ISSN(online): 2643-9875

Volume 08 Issue 12 December 2025

DOI: 10.47191/ijmra/v8-i12-40, Impact Factor: 8.266

Page No. 6920-6926

Legal Responsibility of PT. PLN for Environmental Damage and Pollution Resulting from the Implementation of the Geothermal Project in Mataloko

Bahy Frederick J Eryansan[1], Yohanes Braminus Hidayat[2], Yanuarius M Fay[3], Hyronimus Rithi[4]

[1,2,3,4]Atma Jaya University of Yogyakarta

ABSTRACT: The title of this research is PT. PLN's Legal Responsibility for Environmental Damage & Pollution caused by the Implementation of the Geothermal Project in Mataloko. The core of this legal issue is that PT. PLN, in implementing this geothermal project, did not pay attention to the principle of prudence mandated in the Environmental Protection and Management Law (PPLH), which should be the benchmark for the implementation of large projects such as geothermal projects that pose a high risk to the surrounding environment. In the implementation of the geothermal project, there has been a great deal of environmental pollution and damage in Mataloko. There has been no legal responsibility taken by the government. This study uses a normative legal research method, which analyzes facts and data obtained through literature studies, the Constitution, laws and regulations, government regulations, and also uses Hans Kelsen's theory of legal certainty and social responsibility. The results of this legal study conclude that in the theory of legal certainty, Hans Kelsen, with his pure theory of law, states that law needs to be separated from non-juridical considerations. Law must be pure, logical, and certain. The law must be enforced against violations of regulations in the law, especially environmental law. In accordance with the provisions of Law Number 32 of 2009 concerning Environmental Protection and Management, PT PLN is responsible for restoring the environment and paying compensation. Restoration includes the stages of remediation, rehabilitation, and restoration to return the environment to its original state. In addition, based on Law Number 40 of 2007 concerning Limited Liability Companies, PLN also has Social and Environmental Responsibility (TJSL) that must be implemented as a form of the company's commitment to sustainable development.

KEYWORDS: Law, Environment, Responsibility, Company, Ignorance

I. INTRODUCTION

Indonesia is blessed with enormous natural wealth. Natural resources can be used and managed for the development of the country. Development is a process and effort aimed at improving political, socio-economic and cultural life as well as social infrastructure (Fa'iq Khasmadin & Harmoko, 2021). Various natural resources are found in the earth, water, and air. On earth, for example, there are various types of minerals and, equally important, geothermal energy. These natural resources are beneficial to the welfare of society if they are used responsibly and in accordance with applicable laws. Conversely, they will have a negative impact if their use is irresponsible.

In Indonesia, the development of geothermal energy as a renewable energy source, which utilizes Indonesia's geographical conditions with many active volcanoes, is not new. The use of geothermal energy is regulated in Law No. 21 of 2014 concerning Geothermal Energy, which regulates the use of geothermal energy as a renewable energy source. The use of geothermal energy in Indonesia actually began with exploration in 1918 at Kamojang Crater by JB Van Dijk, which was then continued with drilling by the Dutch Colonial Government of the Netherlands East Indies in 1926 (Sumardi, et al. 2022). On the island of Flores, there are several points that are geothermal project areas. One of them is in Ngada. The Geothermal Power Plant or Geothermal Energy in Mataloko, Ngada Regency began in 1998 after the Indonesian government and the Ngada regency government collaborated with the Japanese government (Bupu et al., 2024).

In its course, the management of geothermal energy as a source of heat has also caused massive environmental damage. In July 2004, a cooperation agreement was signed between the Directorate General of Geology and Mineral Resources (GSDM), the Directorate General of Electricity and Energy Utilization (LPE), the Ngada Regency Government, and PT PLN, with the Directorate General of LPE acting as coordinator. The development of geothermal potential located about 15 km east of Bajawa, the capital

of Ngada Regency, began with preliminary surveys by the Directorate of Volcanology in 1984 and 1997, while exploration activities took place from 1997 to 2002. The first drilling was carried out at three points on an area of 5 hectares. Points 1 and 2 had a depth of 200 m, while point 3 had a depth of 700 m (Widodo Sri, 2002). However, in the process, the management of geothermal energy as a source of heat also caused massive environmental damage. Based on media reports from Panmonitoring Floresa, a rumbling sound was heard from a number of holes of varying widths. In addition to mud, smoke also billowed from the holes. According to Felix, a resident living near the drilling site, hot mud eruptions began in 2006, leaving behind a large crater. After that, dozens of other holes appeared in different locations, continuously spewing hot mud. One of the holes was identified as being located in an irrigation channel that previously served to channel water to residents' agricultural land. The water source came from a spring located about one kilometer west of the agricultural land. According to a report (Prabowo, 2022), at least 11 villages were affected by the failure of the project, which resulted in the destruction of 1,579 residents' homes. In addition, research conducted by Justice Peace and The Integrity of Creation Ordo Fratrum Minorum, a Catholic Church institution that conducted studies and provided assistance to Mataloko residents in 2017, showed that around 30 people lost their farmland due to the eruption of steam and hot mud in the area. (Floresa Team, 2023)

On the other hand, regarding responsibility for the environmental damage that occurred, Law Number 32 of 2009 concerning Environmental Protection and Management requires perpetrators of environmental damage to carry out remediation, rehabilitation, restoration, and/or other measures in accordance with the development of science and technology, as well as applying the principle of strict liability, better known as strict responsibility, for high-risk activities such as the processing of hazardous and toxic waste (Law No. 32 of 2009).

Under this principle, perpetrators are strictly liable for any losses suffered, without requiring prove fault. Furthermore, the Limited Liability Company Law explains social and environmental responsibility. The enactment of Law No. 40 of 2007 on Limited Liability Companies ushered in a new phase in the regulation of social and environmental responsibility. One of the drivers for the implementation of this regulation related to social and environmental responsibility reflects a renewal in the business world's perspective, which places attention on social and environmental issues as a top priority that goes beyond the orientation of generating profits. Corporate responsibility as stipulated in Article 74 of the Limited Liability Company Law emphasizes that every company engaged in, or connected with, natural resources-based business activities is obliged to carry out social and environmental responsibility. This obligation must be allocated in the company's budget and calculated as part of operational costs, with implementation based on the principles of propriety and fairness.

Environmental pollution and damage caused by PT PLN must be followed by legal responsibility, namely compensation and environmental restoration. This study examines the form of responsibility. The legal certainty in the legal norms of the PPLH Law and the UUPT Law is questioned as to whether it has answered the people's sense of justice. In fact, it is legal certainty that produces justice (if justice comes from the law) (Hyronimus Rithi, 2023).

Based on the background of the problem above, the research question in this study is: How is PT PLN legally responsible for the environmental damage and pollution caused by the implementation of the geothermal project in Mataloko? The purpose of this study is to identify and discuss theoretically the legal responsibility of PT PLN for environmental pollution and damage resulting from the implementation of the geothermal project in Mataloko.

II. RESEARCH METHOD

This study was conducted using a normative legal research method through a qualitative analysis approach. This method was carried out by conducting a literature study to examine the substance, quality, and application of a rule or legal norm taken from primary legal materials in the form of applicable laws and regulations related to the concept of corporate responsibility regarding social and environmental responsibility for environmental damage caused by geothermal projects, and secondary legal materials in the form of books, research results, and expert opinions related to corporate responsibility for environmental damage in Mataloko. This study uses two approaches, namely the legislative approach and the case approach. The legislative approach is carried out by examining several laws and regulations and other regulations related to provisions and rules concerning corporate responsibility for environmental damage. The case approach is to examine and understand the case studied in depth in the case of pollution and environmental damage resulting from the implementation of the geothermal project in Mataloko.

III. DISCUSSION

A. Theoretical Framework and Legal Basis for Corporate Responsibility for Environmental Damage

According to Hans Kelsen, law is understood as a system of norms. Norms, in this sense, are statements that emphasize the aspect of "should" (das sollen), which contain provisions about what should be done. Legal norms are the result of rational and purposeful deliberative human actions. Laws that contain general rules serve as guidelines for individuals to behave in society, both in their relationships with other individuals and in relation to society in general. These rules also serve as limitations for society in imposing or taking action against individuals. The existence and application of these rules ultimately create legal certainty (Marzuki, 2008). Kelsen argues that law is not limited by moral considerations and legal interpretations related to non-empirical norms. According to Kelsen, legal positivism must be cleansed of all non-juridical elements, such as sociological, political, historical, and ethical aspects (Situngkir, 2024). Basic norms (Grundnorm) are elements that form a unity in the overall normative order and provide the basis for the legitimacy of every norm originating from the legal system (Asshiddiqie & Ali Safa'at, 2006). Kelsen views legal certainty as clarity, consistency, and the applicability of rules, not as good or bad. Justice can be created through normative and certain law enforcement. According to Jan Mhiciel Otto, the elements of legal certainty include the availability of clear, consistent, and accessible legal rules, citizens who, in principle, adjust their behavior to the rule of law, independent and impartial judges who apply regulations consistently in resolving disputes, and the implementation of concrete court decisions (Soeroso, 2011). In this case, there is environmental pollution and damage from the impact of geothermal projects in Mataloko. The impact of these geothermal projects has been going on for quite some time and there have been no efforts to address legal responsibility. Legal certainty in the field of environmental law is questionable and needs to be analyzed.

Environmental protection in the law on environmental protection and management is understood as any change, whether direct or indirect, to the physical, chemical, and/or biological elements of the environment that exceeds the established environmental damage standards (Law No. 32 of 2009). This can be interpreted as human actions, either directly or indirectly, that alter the environment beyond the established tolerance limits. Moreover, the standard criteria for environmental demage specified in Article 21 encompass those criteria related to demage resulting from climate change. The standard criteria for ecosystem damage cover land degradation affecting biomass production, destruction of coral reefs, and enviormental damage associated with forest and/or land fires, damage to seagrass, damage to peat, damage to karst areas, and other forms of ecosystem damage recognized in accordance with developments from a science and technology prespective. The standard criteria for damage caused by climate change include temperature increase, sea level rise, storms, and/or droughts.

PLN is a legal entity of a limited liability company that acts as the manager of the geothermal project in Mataloko. As a legal entity, PT. PLN has the obligation conduct social and environmental responsibilities consistent with the provinsios stipulated in the Limited Liability Company Law. Social and environmental responsibility in Indonesia has changed from voluntary compliance to mandatory legal authority, as stipulated in Article 74 of the Limited Liability Company Law, particularly for companies that operate in sectors hat involve and/or are connected to natural resources (SDA), including geothermal energy. This means that companies operating in high-risk sectors such as geothermal projects are required to budget for social and environmental responsibility, as the costs and implementation are monitored and sanctions are imposed if ignored (Suriani et al., 2023). The function of social and environmental responsibility goes beyond mere ethical compliance; it is a legal instrument to proactively mitigate social risks and environmental impacts, although the obligation to recover from technical environmental damage, such as remediation and restoration, remains under the umbrella of strict responsibility in the Environmental Protection and Management Law (UUPPLH). Thus, social and environmental responsibility has a dual function: fulfilling legal obligations to contribute to sustainable development while fostering good relations with the surrounding community.

The term Social Responsibility is deliberately used in the Limited Liability Company Law, specifically in Article 74, to emphasize that companies conducting business activities in the field and/or related to natural resources have an obligation to implement Social and Environmental Responsibility. The provisions of Article 74 here emphasize the role of companies in preserving and maintaining environmental sustainability, both in the vicinity of the company's operational area and in other areas outside or not directly related to the scope of the company's business (Pohan, 2018). Furthermore, the UUPT does not specify the amount of funds that must be allocated for the purpose of fulfilling and environmental responsibility, but leaves it to the discretion of each company based on the principles of propriety and fairness (Pohan, 2018).

PT PLN (Persero)'s social and environmental responsibility obligations in the Mataloko Geothermal Power Plant (PLTP) project in Ngada Regency are largely allocated to complementary socio-economic and infrastructure programs. This allocation aims to obtain and maintain community support (social license to operate), not to finance the restoration or repair of technical environmental damage directly. This is because the implementation of geothermal projects in Mataloko generally faces social

conflicts related to customary land ownership and community concerns about the impacts caused by the failure of previous geothermal projects, so that TJSL fund allocations are then directed to address the root causes of these non-technical conflicts first. (Surat Kabar NTT, 2025)

Although the allocation of social and environmental responsibility funds has currently succeeded in reducing conflicts and increasing social acceptance as measured by local labor participation and infrastructure improvements, this strategy is risky because focusing on providing benefits (MSMEs, health) can divert public attention from environmental impacts that have not yet been restored. Companies that implement social and environmental responsibility do not merely fulfill their legal obligations. Social and environmental responsibility not only serves as a fulfillment of legal obligations but also provides various benefits for companies. This is in line with the four business arguments put forward by Kurucz, that is, the carryng out of social and environmental responsibility can contribute to reducing costs and risks, reminding companies of their profits and competitive position, strengthening their legitimacy and corporation, and creating a win-win situation between companies and communities and stakeholders (Carroll, 2016). Local communities may feel the social benefits, but if environmental damage continues to endanger their health or livelihoods through reduced agricultural yields due to soil/water quality, social and environmental responsibility will be seen as temporary compensation rather than a holistic form of responsibility.

PT. PLN's social responsibility approach in Mataloko is in line with the concept of Shared Value Creation (CSV) popularized by Porter and Kramer. CSV focuses on social investments that simultaneously increase the company's competitiveness and meet significant community needs (Porter & Kramer). The construction of road infrastructure and MSME training in Mataloko are concrete examples of CSV. The improved roads not only support PLTP operations but also reduce logistics costs and improve the welfare of local farmers. Within the CSV framework, the allocation of social responsibility funds is considered proportional and strategic because it transforms social criticism into operational support. The funds are focused on People (social) and Profit (economic), which indirectly support the Planet (environment) aspect through clean energy development (Quran ntt news, 2025).

A major problem arises when CSR funds are focused on activities outside of compliance while compliance obligations related to the restoration of certain damage have not been adequately or transparently addressed. As explained earlier, the obligation to repair environmental damage, such as the remediation of contaminated land or the cleaning of hot mud, is a legal obligation separate from CSR.

The Environmental Protection and Management Law further contains provisions on environmental pollution, which is defined as poluution is the introduction of orgaisms, materials, energy, and/or other enviormental components resulting from human activities that surpass set enviormental quality standards (Law No. 32 of 2009). The occurrence of environmental pollution can be assessed using a benchmark reffered to as enviormental quality standards, which comprise standards for water quality, wadtewater, seawater, ambient air, and emissions, disturbance quality standards, and other quality standards that are adjusted to developments in science and technology. Pollution occurs when the level of a substance, energy, or component exceeds the established quality standards. Therefore, to prove that environmental pollution has occurred, environmental measurements and analyses must be carried out, and the results are then compared with the applicable standards in the quality standards. The respective quality standards, standards, or thresholds used as benchmarks for proving environmental protection are regulated in the Government Regulation on the Implementation of Environmental Protection and Management, which is the implementing regulation of the Environmental Protection and Management Law.

The Environmental Protection and Management Law also clearly stipulates who can be held accountable for environmental damage and pollution, namely business entities or corporations, both legal entities and non-legal entities as stipulated in Article 1 paragraph 32. Furthermore, regarding accountability, the UUPPLH in terms of environmental protection and management is implemented based on the polluter pays principle as stipulated in Article 2 letter (j) in conjunction with Article 87, which can be interpreted as meaning that every person who is a company or business entity, whether a legal entity or non-legal entity, that causes environmental damage and pollution must pay compensation.

In the case of the geothermal project carried out by PT. PLN in Mataloko, there are several issues that can be categorized as environmental damage and pollution, namely:

1. Water/river pollution (rivers polluted by hot mud), hot mud and gas (H2S) carry substances and temperatures that alter the chemical and physical composition of rivers. This clearly violates the Water Quality Standards and Wastewater Quality Standards (Article 20), because the levels of Total Suspended Solids (TSS), temperature, or other chemicals exceed the limits allowed for water functions, which then results in damage to irrigated agricultural land with contaminated water/rivers.
2. Damage to Agricultural Land (becoming unproductive), changes in physical and biological properties due to the deposition of mud and chemicals that damage soil structure, kill biological microorganisms, and make the soil corrosive. This exceeds

the Environmental Damage Standard Criteria (KBK-LH) for Ecosystems (Article 21), specifically the criteria for land damage for cultivation (agriculture).

3. Physical Property Damage (Rusty and damaged roofs), chemical property changes due to air contamination or emissions from hot gas emissions, especially those containing sulfur/sulfur (H2S), which cause corrosion. Gas is a component that is introduced into the environment, so it can be categorized as violating the Ambient Air Quality/Emissions Standards as stipulated in Article 20 of the UUPPLH. Drilling emits emissions whose concentration in the air exceeds safe limits, causing physical impacts such as rusting of property.

Environmental damage and pollution in Mataloko, when assessed in accordance with the provisions of the Environmental Protection and Management Law, means that the management, in this case the State Electricity Company (PT. PLN), can be held accountable as stipulated in the Environmental Protection and Management Law and related regulations. Law Environmental Protection and Management (Environmental Protection and Management Law) explicitly requires perpetrators who cause environmental damage, such as that caused by high-risk project leaks in Mataloko, to take action to restore environmental functions through a series of planned actions, including remediation (cleaning), rehabilitation (restoration of functions), and restoration (ecosystem restoration). In addition, for high-risk activities such as geothermal drilling or the processing of hazardous and toxic waste (B3). The PPLH Law applies the principle of strict liability, which means that the responsible party must bear the costs of compensation and recovery without having to prove that there was an element of fault (negligence or intent); it is sufficient to prove that the damage originated from their activities. The provisions related to this absolute liability are contained in Article 88 of the PPLH Law. (Rachma & Triwibowo, 2023)

B. Judicial Analysis of PT. PLN's Legal Liability for Environmental Damage and Pollution in Mataloko

The Environmental Protection and Management Law, in Article 1 paragraph 14, defines environmental pollution as the entry or introduction of living things, substances, energy, and/or other components into the environment due to human activities that exceed the established environmental quality standards. Meanwhile, paragraph 16 environmental damage is described as direst and/or indirect alterations to the physical, chemical, and/or biological characteristic of the environment that go beyond the established environmental damage standard criteria. This can be interpreted/understood to mean that pollution and damage can occur through actions carried out by humans, either directly or indirectly, which impact changes in the surrounding environment, causing an imbalance in the environment that affects humans. Meanwhile, regarding the actions of legal subjects who cause pollution or damage and are liable under the LawEnvironmental Protection and Management Law, Article 1 paragraph 32 defines that legal subjects who can be held accountable for their actions or activities in the environmental field that cause damage or pollution that impacts environmental change are individuals or business entities, both legal and non-legal entities.

Based on the Environmental Protection and Management Law (UU PPLH), the concept of legal responsibility for violations of environmental pollution and damage. Legal Responsibility in the UU PPLH is regulated in Articles 54, 76, 87, 88, 90-115. The elements of legal responsibility from several of these articles are that every person who pollutes and damages the environment, who uses hazardous waste for production and/or management, and who poses a serious threat to the environment, causes damage to other people and the environment. The legal subject in the concept of legal accountability according to the Environmental Protection and Management Law is every person. According to Article 1 point 32 of the PPLH Law, every person is an individual or a business entity, whether a legal entity or a non-legal entity. Therefore, every person referred to in the PPLH Law can be held legally accountable and subject to sanctions. Sanctions in the concept of legal accountability in the PPLH Law vary considerably. There are several types of sanctions in the Environmental Protection and Management Law, namely, restoring environmental functions such as (cessation of pollution sources and provision of pollutants, remediation, rehabilitation, restoration), paying compensation and/or taking certain actions, absolute liability (compensation and environmental restoration costs), and criminal sanctions in the form of imprisonment and fines.

Referring back to the case of the Geothermal Law in Mataloko, in accordance with the concept of accountability in the PPLH Law, it can be qualified as a legal entity that can be held legally accountable for the environmental impacts that are closely related to PT. PLN's activities in this geothermal project. The basic legal reasons are as follows: First, PT PLN is a legal entity subject to the law for every person in accordance with Article 1 number 32 of the PPLH Law. Second, PT. PLN's geothermal project activities have caused environmental damage and pollution. This can certainly be seen from the data showing that there has been river water pollution, soil damage (soil quality has declined to the point of becoming unproductive), and damage to property such as residents' homes. The facts of pollution and environmental damage indicate that PT. PLN's geothermal project activities pose a serious threat and have caused losses. It should be emphasized that the losses suffered by the surrounding community have been going on for quite some time. Third, therefore, PT. PLN can be subject to sanctions in accordance with the applicable articles. From a legal

analysis of PT. PLN's legal responsibility in accordance with the Environmental Protection and Management Law, it can be concluded that PT PLN is responsible for the environmental damage and pollution that has occurred. The legal implication is that PT PLN can be sued, held accountable, and be legally responsible. PT PLN can be sued in accordance with Articles 54, 87, 88, 98-105 of the Environmental Protection and Management Law, both criminally and civilly, in accordance with the legal process stipulated in these articles.

With the theory of legal certainty, Hans Kelsen further strengthens the argument for PT PLN's legal responsibility for the environmental damage and pollution that has occurred. Hans Kelsen's theory of legal certainty talks about Pure Law, where pure law is logical, consistent, and closed. It is law that is free from the influence of other sciences, including morality and ethics. The focus of law according to Hans Kelsen's theory of law is logical and consistent with the standardization of regulations and the application or enforcement of the law. In legal cases based on Article 74 of the Limited Liability Company Law, PT PLN is responsible for environmental pollution and damage that occurs. Also, based on Law Number 32 of 2009 concerning Environmental Protection and Management in accordance with Articles 54, 87, 88, 98 to 115, PT PLN is legally responsible. The logical consistency of a norm in this law is legal certainty. Justice stems from certain laws. The consistency of norms and law enforcement form the basis of legal certainty itself.

IV. CONCLUSION

Based on the discussion of the responsibility of the State Electricity Company (PT PLN) for environmental damage caused by the implementation of the geothermal project in Mataloko, it can be concluded that PT PLN must be held legally responsible for causing significant pollution and environmental damage. In the theory of legal certainty, Hans Kelsen, with his theory of pure law, states that law must be separated from non-legal considerations. Law must be logical and certain. Laws must be enforced against violations of regulations in legislation, particularly environmental law. In accordance with the provisions of the Limited Liability Company Law, PLN also has social and environmental responsibilities that must be carried out as a form of the company's commitment to sustainable development. However, the implementation of social and environmental responsibilities cannot replace the legal obligation to restore environmental damage that has occurred. In addition, based on the Environmental Protection and Management Law, PT PLN has a responsibility to carry out environmental restoration and pay compensation. Restoration includes the stages of remediation, rehabilitation, and restoration to return the environment to its original state. Based on these obligations and considering the environmental damage that has occurred, PT. PLN can be sued in civil court under the provisions of Articles 87 and 88 and criminally under Articles 98 to 115. Thus, the implementation of geothermal projects should not only focus on meeting energy needs, but also take into account environmental protection and the interests of the surrounding community. Concrete and accountable steps are required from PLN in environmental restoration and active community involvement in monitoring, to achieve a balance between development, environmental sustainability, and social justice.

REFERENCES

1) Asshiddiqie, J., & Ali Safa'at, M. (2006). THEORY OF LAW BY HANS KELSEN (1st edition, Vol. 1). Secretary General & Registrar of the Constitutional Court of the Republic of Indonesia. www.mahkamahkonstitusi.go.id
2) Bupu, ME, Kamahi, SB, & HL Lopo, Y. (2024). Environmental political dimensions in the development of the Daratei Geothermal Power Plant (PLTPB) in Ulubelu Village, Golewa District, Ngada Regency. Democracy: Journal of Law, Social and Political Sciences, 1(4), 289–302. https://doi.org/10.62383/DEMOKRASI.V1I4.542
3) Carroll, AB (2016). Carroll's CSR Pyramid: A Second Look. International Journal of Corporate Social Responsibility, 1(1). https://doi.org/10.1186/S40991-016-0004-6
4) Dr. Hyronimus Rithi, S. H., LL. M. (2023). Legal Certainty: Introduction, Theoretical, and Philosophical – KanisiusMedia. PT KanisiusMedia. https://penerbitan.kanisiusmedia.co.id/books/kepastian-hukum-pengantar-teoretis-dan-filosofis/
5) Fa'iq Khasmadin, M., & Harmoko, U. (2021). Study of the Potential and Utilization of Geothermal Energy in the Patuha Ciwidey Geothermal Working Area. Journal of New and Renewable Energy, 2(2), 101–113. https://doi.org/10.14710/JEBT.2021.11187
6) NTT News Newspaper. (2025, February 13). PLN Ensures the Safety of the Mataloko PLTP Project and TJSL Program Impacts the Community | NTT Newspaper. https://koranntt.com/2025/02/13/pln-pastikan-keamanan-proyek-pltp-mataloko-terjamin-dan-program-tjsl-berdampak-ke-masyarakat/
7) Marzuki, PM (2008). Introduction to Science and Law: Vol. xii.

8) Pohan, AP (2018). SOCIAL AND ENVIRONMENTAL RESPONSIBILITY OF LIMITED COMPANIES. Indonesian Legislation Journal, 6(2), 79–86. https://doi.org/10.54629/JLI.V6I2.321
9) Porter, M. E., & Kramer, M. R. (n.d.). HBR.ORG Big Idea: Creating Shared Value: How to Reinvent Capitalism—and Unleash a Wave of Innovation and Growth.
10) Prabowo, H. (2022, August 23). 20 Years of the Mataloko Geothermal Project: Zero Electricity, Damaged Land. https://tirto.id/20-tahun-proyek-geotermal-mataloko-listrik-nihil-lahan-rusak-gvoq
11) Rachma, D. A., & Triwibowo, A. M. (2023). APPLICATION OF STRICT ACCOUNTABILITY PRINCIPLES IN ENFORCING ENVIRONMENTAL LAWS IN INDONESIA. Judicial Journal, 16(1), 103–120. https://doi.org/10.29123/JY.V16I1.574
12) Situmorang, H. (2025). Geothermal Project Brings Renewable Disaster, Loss of Farmers' Living Space - Floresa. Floresa.com. https://floresa.co/perspektif/analisis/79034/2025/09/12/proyek-geotermal-membawa-bencana-terbarukan-merampas-ruang-hidup-petani
13) Situngkir, DA (2024). PURE LEGAL THEORY: HANS KELSEN. Encyclopedia Journal, 6(3), 231–237. https://doi.org/10.33559/EOJ.V6I3.2583
14) Soeroso, R. (2011). Legal Instructor. 346. https://jdih.kemenkeu.go.id/dok/61c1ed53-5f13-4bb8-421e-08db6e8b31bb
15) Sumardi, J. A., Rizqi, M., Asy'ari, A. L., Fadhilah Ramadhan, R., Pinandito, F. S., Purba, D., Adityatama, D. W., Siregar, S., Hafly, M. N., & Fadhillah, F. R. (n.d.). The History of Geothermal Drilling in Indonesia: What Can We Learn from It?
16) Suriani, L., Muhammad, H., Ifansyah, N., & Afrizal, ; (2023). ANALYSIS OF THE MAIN TASKS OF THE CORPORATE ENVIRONMENTAL SOCIAL RESPONSIBILITY FORUM (TJSL) IN SIAK REGENCY: A LITERATURE REVIEW. Jurnal PubBis, 7(2), 160. https://doi.org/10.35722/pubbis.v7i2.794
17) Floresa Team. (2023, December 15). Residents of Mataloko, Flores Continue to Suffer from Geothermal Heat: Project Continues After Repeated Failures and Environmental Disasters - Floresa. https://floresa.co/reportase/liputan-khusus-id/58590/2023/12/15/warga-mataloko-flores-terus-tersengat-panas-bumi-proyek-dilanjutkan-usai-gagal-berulang-dan-timbulkan-bencana-lingkungan
18) LAW OF THE REPUBLIC OF INDONESIA NUMBER 40 OF 2007 concerning Limited Liability Companies
19) Law Number 32 of 2009 concerning Environmental Protection and Management.
20) Widodo Sri, & Nanholy Fredy. (2002). Drilling activities and subsurface geology of the MTL-1 shallow well in the Mataloko geothermal area.