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IMPLEMENTATION OF MANDAILING NATAL REGENT REGULATION NUMBER 36 OF 2022 REGARDING THE GAS LEAK INCIDENT OF SORIK MARAPI PLTP FROM AN INDUSTRIAL AND SCIENTIFIC PERSPECTIVE

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ABSTRACT

This study examines the implementation of Mandailing Natal Regent Regulation Number 36 of 2022 concerning the management of gas leak incidents ats at the Sorik Marapi Geothermal Power Plant (PLTP). The regulation was enacted as a preventive and responsive policy to protect communities living in high-risk areas surrounding geothermal industrial activities. Using an empirical legal research design with a qualitative case study approach, data were collected through in-depth interviews with local government officials, environmental agencies, disaster management authorities, civil society organizations, and affected residents, as well as field observations and document analysis. The findings indicate that although the regulation provides a comprehensive normative framework for emergency preparedness covering early warning systems, evacuation procedures, medical response, and inter-agency coordination its implementation has not been fully effective. Key shortcomings include the absence of functional gas detection and warning systems in residential areas, unstructured evacuation mechanisms, reactive rather than preventive medical responses, and weak coordination between local authorities and geothermal operators. From the perspective of siyasah dusturiyah, these shortcomings reflect a failure to optimally realize the principle of ḥifẓ al-nafs (protection of human life) as a fundamental objective of governance. This study contributes to empirical legal scholarship by highlighting the gap between regulatory norms and field implementation in environmental risk governance. It underscores the need for stronger institutional accountability, integrated emergency management systems, and community-based preparedness to ensure that public safety regulations function effectively in high-risk industrial zones.

Keywords: *Implementation, Regent Regulation, Gas Leakage, Siyasah Dusturiyah*

1. INTRODUCTION

The development of the geothermal energy sector is part of the national strategy to accelerate the transition to sustainable energy and reduce dependence on fossil fuels. Indonesia, as a country located on the Ring of Fire, has significant geothermal potential and is continuously being developed as a new and renewable energy source. However, the development of the geothermal industry is not without various environmental and safety risks, particularly hazardous gas leaks, which can directly impact the health and safety of communities surrounding the operation area (World Bank, 2020; International Energy Agency [IEA], 2021).

One incident that underscored the urgency of managing these risks was the gas leak incident at the Sorik Marapi Geothermal Power Plant (PLTP) in Mandailing Natal Regency. This incident caused health problems for residents and sparked public concern about the preparedness of local governments and industry managers to protect the public from the impacts of high-risk energy activities. In this context, the Mandailing Natal Regency Government established Regent Regulation Number 36 of 2022 as a policy instrument for emergency response due to gas leaks, covering aspects of early detection, evacuation, medical services, and cross-sector coordination.

In the perspective of Islamic law, protecting the safety of human souls is the main goal of the Shari'a (maqāṣid al-syarī'ah), especially in the aspect of ḥifẓ al-nafs. This principle emphasizes that every public policy that has the potential to cause danger must be controlled so that it does not threaten human life. The Qur'an strictly prohibits all forms of actions that plunge humans into destruction as Allah SWT says:

وَلَا تُلْقُوا بِأَيْدِيكُمْ إِلَى التَّهْلُكَةِ

Meaning: "And do not throw yourselves into destruction." (Quran 2:195)

This verse emphasizes the obligation to avoid all actions, policies, or negligence that could potentially endanger human life. In the context of public policy, this verse can be understood as a preventive order for the government not to allow its people to be in dangerous conditions without adequate protection and security. Furthermore, Islam places a strong emphasis on the dignity of human life. This is emphasized in the words of Allah SWT in Quran 5:32.

مَنْ قَتَلَ نَفْسًا بِغَيْرِ نَفْسٍ أَوْ فَسَادٍ فِي الْأَرْضِ فَكَأَنَّمَا قَتَلَ النَّاسَ جَمِيعًا ۖ وَمَنْ أَحْيَاهَا فَكَأَنَّمَا أَحْيَا النَّاسَ جَمِيعًا

This means: *"Whoever kills a human being, not in retaliation for another human being or for causing mischief on earth, it is as if he has killed all mankind. And whoever saves the life of a human being, it is as if he has saved the life of all mankind."* (Quran 5:32).

Normatively, the existence of these regulations reflects the state's commitment to protecting its citizens, as is the basic principle of the rule of law and responsible

governance (Friedman, 2017). However, various studies show that the success of regulations is determined not only by the completeness of legal norms, but also by the effectiveness of their implementation on the ground, particularly in emergency situations that demand a rapid, coordinated, and risk-based response (Howlett, Ramesh, & Perl, 2020). This gap between norms and practice is often the source of public policy failure, particularly in the context of environmental risk management and the extractive industry. From an Islamic legal perspective, the state's responsibility to protect public safety aligns with the principle of maqāṣid al-syarīʻah, particularly the protection of life (ḥifẓ al-nafs). This principle asserts that all public policies must be directed at preventing harm and protecting human life as the primary goal of government (siyasah industrial) (Auda, 2015; Kamali, 2019). Therefore, the state's failure to ensure the implementation of public safety policies can be viewed as a failure to achieve the goal of public welfare, which underpins the legitimacy of its power.

Several previous studies have examined industrial safety, environmental risk management, and energy policy governance, from the perspectives of positive law, public policy, and the environment (Sovacool, 2018; Lyster, Bradbrook, & McCallum, 2019). However, most of these studies focus on the national regulatory framework or technocratic aspects of the industry, while studies specifically examining the implementation of regional regulations in the context of geothermal industrial emergencies are relatively limited. Furthermore, the integration of an empirical legal approach and a siyasa industrial perspective in assessing the effectiveness of public safety policies has not been explored in depth.

Based on this gap, this study aims to analyze the implementation of Mandailing Natal Regent Regulation Number 36 of 2022 in addressing the Sorik Marapi Geothermal Power Plant gas leak incident through an empirical legal approach. This research not only assesses the alignment between regulatory norms and field practices but also evaluates the extent to which the policy reflects the principle of life protection (ḥifẓ al-nafs) as an ethical and constitutional foundation for regional governance. Therefore, this study is expected to provide theoretical contributions to the development of empirical legal studies and siyasa industrial perspectives, while also offering practical implications for improving public safety governance in high-risk industrial areas.

2. RESEARCH METHOD

This research uses a qualitative approach with an empirical legal research design (non-doctrinal legal research) combined with a case study method. This approach was chosen because it allows researchers to analyze the implementation of legal norms contextually through direct observation of policy practices in the field and interactions between actors involved in mitigating the gas leak incident at the Sorik Marapi Geothermal Power Plant (PLTP) in Mandailing Natal Regency (Creswell & Poth, 2018; McConville & Chui, 2017).

The research location was determined in the area surrounding the Sorik Marapi Geothermal Power Plant directly impacted by the gas leak incident. The research subjects consisted of 12 key informants purposively selected based on the relevance of their roles and knowledge to the implementation of Mandailing Natal Regent Regulation Number 36 of 2022. These informants included local government officials (the Regional Disaster

Management Agency and the Environmental Agency), sub-district and village officials, representatives of civil society/environmental organizations, local health workers, and residents directly affected by the gas leak incident. The selection of informants aimed to obtain a comprehensive and balanced perspective on emergency management policies and practices in the field (Patton, 2015).

Research data was collected through three main techniques: in-depth interviews, field observations, and documentation studies. Interviews were conducted semi-structured to allow for in-depth exploration of informants' experiences, perceptions, and assessments regarding the effectiveness of policy implementation. Field observations focused on emergency preparedness, the availability of early warning systems, evacuation routes, and institutional responses during and after the incident. The documentation study included a review of Regent Regulation No. 36 of 2022, official local government reports, environmental documents, and relevant media coverage. This combination of techniques was used to increase the depth and accuracy of the data obtained (Yin, 2018).

Data analysis was conducted in stages and simultaneously with the data collection process. The analysis stages include data reduction, data presentation, and conclusion drawing/verification, as outlined by Miles, Huberman, and Saldaña (2014). In the data reduction stage, interview and observation data were coded thematically to identify key patterns related to preparedness, emergency response, and institutional coordination. The data were then presented in analytical matrices and narratives to facilitate the connection between regulatory norms and implementation practices. The findings were interpreted by linking the empirical data to the positive legal framework and the perspective of siyasa dusturiyah (the legal system), particularly the principle of ḥifẓ al-nafs (the principle of self-determination) as an ethical benchmark for protecting public safety.

To ensure data validity, this study employed source and method triangulation techniques. Source triangulation was conducted by comparing information obtained from various informants, while method triangulation was conducted through comparisons of interviews, observations, and documentation. Furthermore, limited member checking was conducted with several key informants to ensure the accuracy of the researcher's interpretation of the data presented (Lincoln & Guba, 1985; Creswell & Poth, 2018).

3. RESULT AND ANALYSIS

Normative Framework of Mandailing Natal Regent Regulation Number 36 of 2022

Mandailing Natal Regent Regulation Number 36 of 2022 was drafted as a regional policy instrument to address emergencies resulting from potential gas leaks arising from the Sorik Marapi Geothermal Power Plant (PLTP). Normatively, this regulation is intended to provide a systematic framework for local governments and stakeholders in prevention, preparedness, emergency response, and post-event recovery. The scope of the regulation includes early warning mechanisms, evacuation procedures, emergency health services, and cross-sector coordination necessary in high-risk industrial emergency situations (Howlett, Ramesh, & Perl, 2020).

The primary objective of the Regent Regulation is to protect the safety and health of communities living around the PLTP's operating area while minimizing the environmental impacts of gas leaks. In the context of public policy, this regulation represents a risk

governance approach, namely the government's efforts to manage technological and industrial risks through preventative and responsive regulations (Sovacool, 2018). Thus, Regent Regulation No. 36 of 2022 serves not only as a legal basis for emergency measures but also as an instrument of state legitimacy in intervening in situations that threaten public safety.

In terms of authority and obligations, this Regent Regulation establishes the role of local governments as the primary coordinators in emergency response. The Regional Disaster Management Agency (BPBD) is mandated to coordinate emergency response and evacuation, while the Environmental Agency (DLH) is responsible for monitoring and controlling environmental impacts. Furthermore, health facilities are required to provide emergency medical services, village officials play a role in disseminating information and securing residents, and geothermal power plant operators are obligated to support risk mitigation efforts and provide necessary technical information (OECD, 2014).

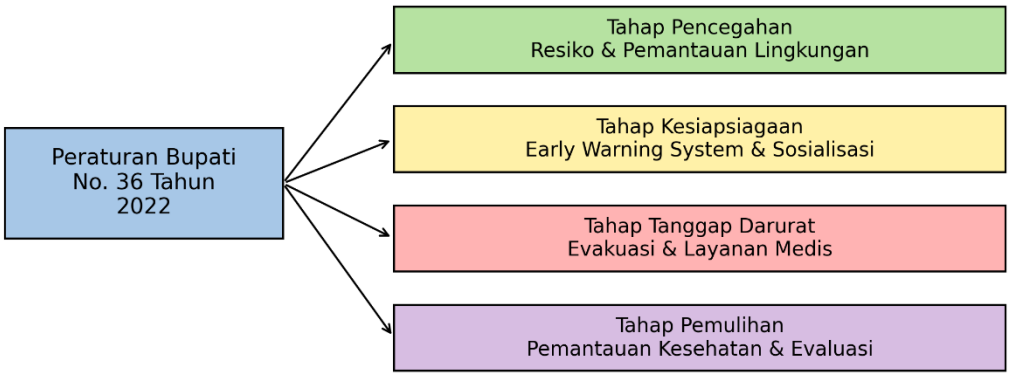

Figure 1. Stages of Emergency Response

The diagram above shows that the emergency response and environmental safety control system in Mandailing Natal Regent Regulation Number 36 of 2022 is developed in a structured, phased manner. These stages begin with the legal basis, continue with prevention, preparedness, emergency response, and conclude with recovery. This flow emphasizes that emergency response is not solely focused on post-event management but also emphasizes prevention and preparedness efforts as a form of early protection for public safety.

The first stage is prevention, which includes risk identification, environmental monitoring, and potential hazard control. At this stage, local governments and companies are required to map gas leak risks, supervise geothermal power plant operations, and monitor air quality regularly. Legally, the prevention stage implements the precautionary principle in environmental law, which aims to prevent damage and loss of life before an emergency occurs.

The second stage is preparedness, characterized by the provision of an early warning system, public outreach, and the development of standard operating procedures for emergency response. At this stage, Regent Regulation Number 36 of 2022 requires the provision of gas detection devices, warning sirens, and a mechanism for delivering information that is fast and easily understood by the public. Technically, preparedness

serves as a bridge between prevention and emergency response, ensuring the public has sufficient time and knowledge to evacuate when an incident occurs.

The third stage is emergency response, which is implemented when a gas leak or emergency actually occurs. This stage involves community evacuation, the provision of emergency medical services, and cross-agency coordination involving the Regional Disaster Management Agency (BPBD), the Health Office, the Environmental Agency, village officials, and the company. The Regent Regulation places the BPBD as the primary coordinator in this stage, ensuring a rapid, integrated, and targeted response to minimize casualties and public health impacts.

The final stage is recovery, which includes monitoring the health of affected communities, restoring environmental quality, and evaluating the causes of the emergency. This evaluation serves as the basis for policy improvements and strengthening environmental safety control systems to prevent similar incidents from recurring. Legally, the recovery phase demonstrates that the government's responsibility does not stop with emergency response, but continues until conditions for the community and environment are safe and sustainable.

Therefore, Regent Regulation Number 36 of 2022 normatively contains systematic regulations regarding the stages of emergency response and environmental security control, from prevention to recovery, as an operational framework for local governments and relevant parties in addressing environmental risks resulting from industrial activities.

Implementation of Mandailing Natal Regent Regulation Number 36 of 2022 in the Sorik Marapi Geothermal Power Plant Gas Leak Incident

The implementation of Mandailing Natal Regent Regulation Number 36 of 2022 in the Sorik Marapi Geothermal Power Plant gas leak incident demonstrates a significant gap between the normative design of the policy and the practice of mitigation in the field. Formally, this regulation establishes procedures for preparedness, emergency response, and the division of roles between agencies. However, empirical findings indicate that when an incident occurs, the regulated mechanisms are not optimally implemented, particularly in terms of early detection and initial response. This condition shows that the existence of regulations does not automatically guarantee the effectiveness of public safety protection without the support of an adequate operational system (Howlett, Ramesh, & Perl, 2020).

One key finding was the failure of the early warning system as mandated by the Regent's Regulation. Communities surrounding the geothermal power plant (PLTP) received no official information or warnings before being exposed to the impacts of the gas leak, resulting in a spontaneous and uncoordinated response. From a public policy perspective, the failure of the early warning system is an indicator of weak preparedness and risk management, as early warning serves as a crucial instrument for minimizing casualties and health impacts (Sovacool, 2018). This finding suggests that policy implementation remains reactive, rather than preventive.

In terms of evacuation, implementation on the ground did not fully follow the procedures established in the regulation. Evacuations of residents were carried out informally, without clear evacuation routes and without integrated coordination between local governments, village officials, and geothermal power plant operators. This situation reflects weak horizontal and vertical coordination between policy actors, which in policy implementation literature is often cited as a major cause of public policy failure at the local

level (Pressman & Wildavsky, 1984). As a result, protection for vulnerable groups such as children and the elderly could not be optimally guaranteed.

The medical response to affected residents also demonstrated limitations in policy implementation. Health services are primarily curative post-event, while preventive measures such as initial health checks, short-term monitoring, and the provision of medical information are not well structured. In the context of industrial emergencies, the health system should be an integral part of planned and sustainable risk management (World Health Organization [WHO], 2017). This situation emphasizes that public health aspects have not been fully integrated in the implementation of Regent Regulation No. 36 of 2022.

From an institutional perspective, the roles and responsibilities of the actors stipulated in the Regent Regulation have not been implemented synergistically. The Regional Disaster Management Agency (BPBD), Environmental Agency (DLH), health facilities, village officials, and geothermal power plant operators tend to work within their respective sectoral frameworks, without clear emergency command and coordination mechanisms. In a collaborative governance approach, policy effectiveness depends heavily on institutional capacity and a shared commitment between actors to share information and resources (Ansell & Gash, 2008). These findings indicate that the implementation of the regulation still faces structural and administrative obstacles.

Normatively, the weak implementation of Regent Regulation No. The enactment of Law No. 36 of 2022 on the Sorik Marapi Geothermal Power Plant gas leak incident has serious implications for the principle of public safety protection. From an industrial policy perspective, the state's failure to ensure effective preparedness and response can be seen as a suboptimal realization of the principle of life protection (hifẓ al-nafs) as the primary objective of public policy (Auda, 2015; Kamali, 2019). Therefore, these findings emphasize that strengthening policy implementation, institutional coordination, and early warning systems are key prerequisites for regional regulations to not remain normative but to truly function as instruments for protecting citizens in high-risk industrial areas.

Based on these facts, it can be concluded that the implementation of Mandailing Natal Regent Regulation Number 36 of 2022 regarding the handling of the Sorik Marapi Geothermal Power Plant gas leak has not been carried out effectively and optimally. The absence of a functioning early warning system, the lack of evacuation routes and emergency assembly points, weak medical preparedness, and minimal coordination and outreach indicate a serious gap between normative provisions and field practice. This situation indicates that the regulation's primary objective, namely protecting public safety, has not been fully realized.

No	Unit of Analysis	Implemented	Not Implemented	Information
1	Prevention Stage			
	1. The government continuously identifies and controls environmental risks.	✓		Risk identification was conducted through environmental documents and company technical reports, but these were administrative in nature and

				not directly disseminated to affected communities.
	2. The government monitors industrial activities that have the potential to pose a hazard to the community.	✓		Monitoring was conducted by the Environmental Agency through periodic reports and limited field visits.
	3. Community involvement in environmental risk prevention efforts.		✓	No formal mechanism for community involvement in the risk prevention and control process was found.
2	Preparedness Stage			
	1. Mandatory installation of hazardous gas detection devices.	✓		Gas detection equipment is available in the geothermal power plant operational area.
	2. Provision of warning sirens.		✓	Sirens are only available in the company's internal area and do not reach residential areas.
	3. Mechanisms for delivering information that is fast, accurate, and easily understood by the community.		✓	There is no direct notification system for the community when a gas leak occurs.
	4. Public awareness and preparedness simulations.		✓	The community stated they had never participated in gas leak preparedness simulations or training.
3	Emergency Response Stage			
	1. Inter-agency coordination in emergency management.	✓		Coordination was conducted after the incident through the Regional Disaster Management Agency (BPBD), the Health Agency, and the company.
	2. Evacuation of affected communities.		✓	The evacuation was carried out spontaneously by the community without official evacuation route guidance.
	3. Provision of emergency medical services at affected locations.	✓		Medical services were provided after residents experienced health problems.

4	Recovery Stage			
	1. Post-event public health monitoring.	✓		Health checks were conducted by local health facilities.
	2. Environmental safety recovery and evaluation.		✓	No public evaluation report regarding the cause of the gas leak and long-term remedial measures was found.

Analysis of Policy Implementation from a Siyasah Industriyah Perspective

A synthesis of empirical findings indicates that the implementation of Mandailing Natal Regent Regulation Number 36 of 2022 still faces various fundamental weaknesses in the aspects of early warning, evacuation, medical response, and institutional coordination. The malfunctioning early warning system, unstructured evacuation procedures, reactive health services, and weak synergy between policy actors indicate that the policy has not been implemented comprehensively. Within a public policy framework, this condition reflects a failure at the implementation stage, where formulated legal norms are unable to be effectively translated into concrete actions on the ground (Pressman & Wildavsky, 1984; Howlett, Ramesh, & Perl, 2020).

From a siyasah industriyah perspective, the primary function of government is to ensure the public welfare and prevent harm, with the protection of life (ḥifẓ al-nafs) as one of its fundamental objectives (maqāṣid al-syarīʻah). This principle requires the state to be proactive in preventing threats to public safety, particularly those stemming from high-risk development policies and industrial activities (Auda, 2015; Kamali, 2019). Based on research findings, the implementation of regional policies in handling the Sorik Marapi PLTP gas leak incident has not fully reflected this commitment, as prevention and life protection mechanisms have not been optimally implemented.

Figure 2. Analysis of Siyasah Dusturiyah

An evaluation of the implementation of Regent Regulation No. 36 of 2022 also shows that the principle of public welfare (al-maṣlaḥah al-'āmmah) has not been optimally realized. Public welfare requires that policies provide tangible benefits to the wider community, especially vulnerable groups directly impacted by industrial risks. When early warning systems are unavailable and emergency coordination is ineffective, policies lose their social effectiveness and fail to fulfill their normative purpose as instruments for public protection (Masud, 2018; UNDP, 2018). Thus, the regulation remains formalistic and does not fully function as a tool for equitable risk management.

With regard to the protection of life (ḥifẓ al-nafs), the regulation normatively establishes mechanisms for public protection through early warning systems, evacuation, and health services. This principle aligns with the words of Allah SWT:

وَلَا تُلْقُوا بِأَيْدِيكُمْ إِلَى التَّهْلُكَةِ

The meaning: *"And do not throw yourselves into destruction."* (Quran 2:195).

This verse forms the basis for government regulations to be preventive against potential dangers. However, in addition to protecting lives, the industrial sector also demands environmental protection as part of the objectives of sharia, known as the concept of ḥifẓ al-bi'ah. Environmental damage caused by high-risk industrial activities will ultimately have a direct impact on human life, health, and the economic sustainability of the community. Therefore, environmental safety controls in the Regent's Regulation are

part of the government's sharia-compliant obligation to prevent environmental damage (fasād fī al-arḍ).

The failure to implement the policy in this context can be understood not only as a technical-administrative issue, but also as an ethical failure of the state in carrying out its mandate to protect its citizens. In industrial governance, the legitimacy of power is largely determined by the government's ability to safeguard the safety and dignity of human beings as the primary subjects of public policy (Kamali, 2019). Therefore, the weaknesses in the implementation of Regent Regulation No. 36 of 2022 emphasize the need to strengthen administrative accountability, increase institutional capacity, and internalize the value of life protection at every stage of policymaking, so that regional regulations truly reflect the principles of public welfare and substantive justice.

4. CONCLUSION

Based on the results of research and discussion regarding the implementation of Mandailing Natal Regent Regulation Number 36 of 2022 concerning Emergency Response and Environmental Security Control in the Sorik Marapi Geothermal Power Plant gas leak incident, it can be concluded that normatively the regulation has regulated emergency response mechanisms quite comprehensively, starting from the prevention stage, preparedness, emergency response, to recovery. However, in practice, there are still gaps between normative provisions and reality on the ground, especially in aspects of preparedness, early warning systems, community evacuation, and inter-agency coordination. Viewed from the perspective of siyāsah dustūriyyah, this condition indicates that the implementation of the regional government's obligations as holders of the mandate of power has not been fully optimal, both in protecting people's lives (ḥifẓ al-nafs), maintaining environmental sustainability (ḥifẓ al-bī'ah), and ensuring justice and social security for affected communities. Furthermore, economically, the existence of geothermal power plants, which should bring benefits, actually creates social and health burdens for the community if the environmental risks are not managed properly, thus preventing the goals of justice and public welfare from being fully achieved.

Based on these conclusions, it is recommended that the Mandailing Natal Regency Government conduct a comprehensive evaluation of the implementation of Regent Regulation Number 36 of 2022, with an emphasis on strengthening the prevention and preparedness system, including optimizing gas detection equipment, providing warning sirens in residential areas, establishing clear evacuation routes, and improving coordination between relevant agencies. Furthermore, the regional government needs to ensure that environmental protection is an integral part of emergency response policies as a manifestation of the principle of ḥifẓ al-bī'ah (fairness and justice), and ensure justice for affected communities through information transparency, health recovery, and socio-economic protection. Geothermal power plant companies are advised to significantly increase their environmental and social responsibilities, not only for regulatory compliance but also as a form of economic and moral justice for the surrounding community. With these steps, it is hoped that the implementation of emergency response policies in the future can truly reflect the principles of the mandate of power, justice, protection of life, and environmental sustainability as desired in the siyāsah dustūriyyah.

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