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National Vital Object Security Management Approach in Supporting Sustainable Tourism in Geothermal Power Plants

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ABSTRACT

Purpose of the Study: This study aims to analyze and prioritize security management approaches—preemptive, preventive, and repressive—to safeguard the Dieng Geothermal Power Plants, designated as a National Vital Object (Obvitnas), while simultaneously promoting sustainable tourism development in the Dieng area. Balancing national security requirements with community-based tourism initiatives presents a complex challenge that this study seeks to address.

Methodology: A qualitative research method was employed, integrating the Analytical Hierarchy Process (AHP) to systematically prioritize security strategies. Data collection involved structured surveys and in-depth interviews with three key stakeholder groups: company management, security personnel, and community leaders. Triangulation was used to validate findings and ensure a comprehensive understanding of diverse stakeholder perspectives.

Main Findings: The results reveal that the preemptive security approach is prioritized as the most critical strategy, emphasizing the importance of community involvement, partnership programs, and environmental initiatives to ensure the safety of the geothermal plant while fostering trust and collaboration with local communities. Repressive and preventive approaches, while still important, are ranked lower in effectiveness for achieving both security and tourism sustainability objectives. The study highlights that fostering proactive community engagement and ecological stewardship can serve as dual drivers of security and socio-economic development.

Novelty/Originality of this Study: This research offers a novel integration of security management and sustainable tourism principles, proposing a community-centered security framework specifically adapted for Obvitnas like Dieng GPPs. It provides new insights into how national energy infrastructure can be protected without hindering, and even supporting, local tourism growth and community empowerment.

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1. INTRODUCTION

Indonesia, situated along the geologically active “Ring of Fire” belt, possesses one of the world's largest potentials for geothermal energy. Ranking second globally in geothermal capacity after the United States, Indonesia holds vast opportunities to leverage this sustainable energy source [1]-[5]. However, despite this tremendous potential, geothermal energy development in Indonesia remains significantly underutilized. According to the Directorate of Geothermal Energy, Ministry of Energy and Mineral Resources (2020), by the

end of 2019, only 2,130.6 MW of geothermal capacity had been realized, representing merely 8.9% of the estimated national potential.

Efforts to optimize geothermal energy usage are critical to addressing Indonesia's sustainable and long-term electricity needs. The development and operation of Geothermal Power Plants (GPPs) are central to this mission [6]-[9]. Yet, managing GPPs goes beyond overcoming technical and operational challenges; it also requires the implementation of a robust and comprehensive security system. Ensuring the smooth and uninterrupted operation of GPPs is essential in facing various internal and external threats [10]-[14].

The Dieng Geothermal Power Plants (GPPs), operated by PT Geo Dipa Energi (Persero) in Wonosobo Regency, Central Java, provide a critical case study. Unlike GPPs located in isolated areas, the Dieng GPP is situated near densely populated residential zones and popular tourist attractions. This unique geographical context exposes the plant to distinct security challenges, arising from dynamic socio-economic interactions with local communities and tourists [15]-[19]. Such proximity not only amplifies potential risks but also necessitates careful management of complex interdependencies between operational security and community engagement.

Recognizing its strategic importance, the Indonesian government has designated Dieng GPP as a National Vital Object (Obvitnas) through the Minister of Energy and Mineral Resources Decree No. 159.K/90/MEM/2019. This designation signifies Dieng GPP's critical role in supporting the national energy supply and underscores the need for heightened security measures. The plant's operations must comply with stringent security regulations, including Ministerial Regulation No. 48/2018 and National Police Regulation No. 13/2017, which frame the legal and institutional foundations for safeguarding critical national infrastructure. Given these unique vulnerabilities, security management at Dieng GPP must adopt a multi-dimensional approach, incorporating preemptive, preventive, and repressive strategies. Preemptive measures involve proactive community engagement, stakeholder collaboration, and early threat identification. Preventive efforts include security infrastructure enhancements and strategic partnerships with law enforcement. Repressive actions are necessary for enforcing compliance and responding to security incidents as they arise.

However, the practical implementation of these strategies faces significant hurdles. The plant's proximity to residential and tourism hubs creates continuous risks that demand specialized, culturally sensitive security frameworks. Furthermore, challenges such as limited resources, low public awareness regarding Obvitnas regulations, and difficulties in harmonizing national security requirements with local socio-cultural norms hinder the effectiveness of security measures [19]-[23].

Despite the recognized importance of security in energy infrastructure, existing research predominantly focuses on the technical, environmental, and economic aspects of geothermal energy development, often neglecting the critical dimension of security management, particularly within socially complex environments like Dieng. Previous studies have rarely explored context-specific security challenges faced by GPPs located near active communities and tourist destinations. Furthermore, while regulations and standards have been established at the national level, empirical studies examining the real-world effectiveness, prioritization, and contextual adaptation of security approaches in GPPs remain scarce. Additionally, few studies integrate the security management dimension with the goals of sustainable tourism and community development, even though these sectors are deeply intertwined in regions like Dieng. The lack of research that bridges operational security concerns with socio-economic development priorities presents a significant gap that needs addressing.

Therefore, this study aims to fill this gap by critically analyzing, prioritizing, and contextualizing the most effective security strategies for GPPs located in socially dynamic areas. By incorporating perspectives from company management, security personnel, and local community leaders, this study provides a comprehensive evaluation of security management practices using a systematic analytical method. This study seeks to identify and prioritize security management strategies for Dieng GPP through a comprehensive assessment of preemptive, preventive, and repressive approaches. The research applies a qualitative methodology, employing the Analytical Hierarchical Process (AHP) for data analysis. Primary data collection involves surveys and in-depth interviews with key stakeholders, ensuring that the study reflects diverse perspectives across operational, security, and community dimensions.

The findings demonstrate that preemptive strategies particularly community involvement, stakeholder partnerships, and environmental initiatives should be prioritized. These approaches not only enhance security but also support the sustainable tourism goals of the Dieng region, aligning operational stability with broader socio-economic development objectives. Through its findings, the study offers valuable insights for GPP operators, policymakers, and security practitioners by advocating for context-sensitive, inclusive security frameworks. The results contribute to the ongoing discourse on critical infrastructure protection in Indonesia and underscore the necessity of integrating energy security management with community empowerment and sustainable regional development.

2. RESEARCH METHOD

The study employs a qualitative method, utilizing the Analytical Hierarchy Process (AHP) as an analytical tool. AHP is used to rank or prioritize various alternatives in problem-solving. The process begins with constructing a hierarchy based on the research objectives, followed by identifying the criteria elements and alternatives derived from the exploration of ideas and knowledge in the context of the complex reality. Hierarchy formulation can also be facilitated through brainstorming sessions with Company Management or relevant stakeholders to identify the desired attributes.

The criteria for this study were determined through an in-depth literature review focusing on aspects that influence security performance. Initially, eight criteria were identified: cost, deterrence, duration, community involvement, human resources, technology, coordination systems, and infrastructure. However, after brainstorming sessions with Company Management and relevant stakeholders, only five criteria were deemed most relevant to the specific conditions of the Dieng Geothermal Power Plant (GPP): cost, deterrence, duration, community involvement, and human resources. The alternatives for security management are based on three approaches: preemptive, preventive, and repressive.

Once the criteria and alternatives have been established, the next step is to prioritize the security management approaches. This prioritization is based on data collected from interviews and questionnaires with informants. Three key stakeholder groups represent the informants: Company Management (CM), Security Personnel (SP), and Community Leaders (CL) from the area surrounding the Dieng Geodipa GPP. Company Management is represented by Geodipa, the Obvitnas manager, Security Personnel as the security cooperation partner, and Community Leaders who represent the local community's role in supporting the security of the Dieng GPP. AHP serves as a decision support model that relies on human perception as the primary input from decision-makers. The fundamental principles of AHP include constructing a hierarchy (Figure 1), determining priorities, ensuring logical consistency (Equations 1 & 2), and calculating both grand priority and global priority. Constructing the hierarchy simplifies the process of breaking down complex realities into homogeneous clusters, which are then further divided into smaller, more manageable parts.

Weighting is then performed within the hierarchy using pairwise comparison. This method compares homogeneous elements in pairs, making the comparisons easier and more objective. The result of this calculation is a vector matrix that indicates the relative importance of each element, which helps in creating a prioritized solution based on the assessment. For a matrix to be considered consistent, the consistency ratio (CR) must be less than 0.1, meaning the allowed inconsistency is no more than 10%. Finally, decisions are made based on the priorities obtained. To determine the global priority, each alternative's weight is multiplied by the weight of the corresponding criteria. The outcome of this calculation determines the prioritized decision to be made.The random index (RI) for a matrix of order n can be found in Table 1.

Tabel 1 . Random Index (RI)

N	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.45	1.49

3. RESULTS AND DICUSSION

The results of this study aim to determine the priority of security management approaches, which can be used as a consideration by Geodipa in formulating strategies and security programs for the National Vital Object (Obvitnas). Therefore, the Security Management System becomes the primary decision goal, consisting of 5 criteria and 3 alternatives that will be tested, as shown in Figure 2.

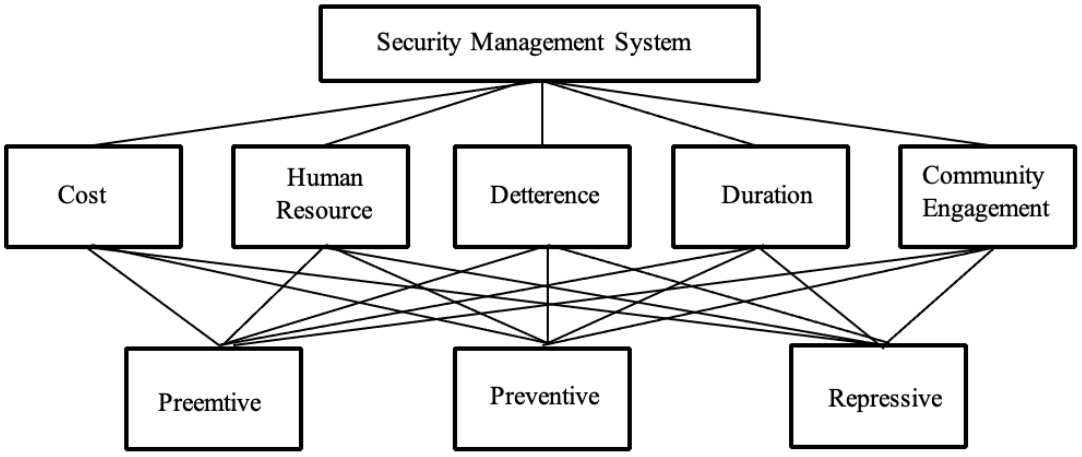

Figure. 2 AHP Structure of the Dieng PLTP Security Approach

The criteria consist of cost (B), human resources (HR), deterrence (DT), duration (D), and community involvement (KM), while alternatives consist of preemptive (PE), preventive (PV), and repressive (RP). These criteria and alternatives are compared through *pairwise comparison* conducted by the speakers. The *pairwise comparison* matrix is defined as follows:

$$Kriteria = \begin{matrix} \boldsymbol{K11} & \boldsymbol{K12} & \boldsymbol{K13} & \boldsymbol{K14} & \boldsymbol{K15} \\ \boldsymbol{K21} & \boldsymbol{K22} & \boldsymbol{K23} & \boldsymbol{K24} & \boldsymbol{K25} \\ \boldsymbol{K31} & \boldsymbol{K32} & \boldsymbol{K33} & \boldsymbol{K34} & \boldsymbol{K35} \\ \boldsymbol{K41} & \boldsymbol{K42} & \boldsymbol{K43} & \boldsymbol{K44} & \boldsymbol{K45} \\ \boldsymbol{K51} & \boldsymbol{K52} & \boldsymbol{K53} & \boldsymbol{K54} & \boldsymbol{K55} \end{matrix} \quad (1)$$

Where:
K11 : the value of the comparison of criterion 1 with criterion 1
K23 : value from the comparison of criterion 2 with criterion 3
K54 : the value of the comparison of criterion 5 with criterion 4

$$\text{Alternatif} = \begin{matrix} \boldsymbol{A11} & \boldsymbol{A12} & \boldsymbol{A13} \\ \boldsymbol{A21} & \boldsymbol{A22} & \boldsymbol{A23} \\ \boldsymbol{A31} & \boldsymbol{A32} & \boldsymbol{A33} \end{matrix} \quad (2)$$

Where:
A11: the value of the comparison of alternative 1 with alternative 1
A12: the value of the comparison of alternative 1 with alternative 2
A32: the value of the comparison of alternative 3 with alternative 2

3.1. Evaluation of Criteria

From the results of the comparison, the value or weight of each criterion was obtained as a basis for determining the criteria that must be prioritized in security management at the Dieng PLTP Obvitnas. A priority recapitulation of the criteria can be seen in table 2.

Table 2. Priority Criteria Recapitulation

Responden	Prioritas Kriteria					CR
	I	II	III	IV	V	
MP 1	SDM	DT	KM	D	B	0.09 0.02
MP 2	KM	DT	SDM	D	B	0.08
MP 3	KM	SDM	DT	D	B	
PP 1	KM	SDM	D	B	DT	0.09
PP 2	KM	SDM	B	D	DT	0.07
PP 3	KM	SDM	B	D	DT	0.08
TM 1	KM	SDM	D	DT	B	0.09
TM 2	SDM	KM	D	B	DT	0.02
TM 3	D	KM	SDM	DT	B	0.04
Priority	KM	SDM	D	B	DT	
Bobot Prioritas	0.40	0.29	0.15	0.10	0.06	

Information:
MP : Corporate Management
PP : Security Personnel
TM : Community Leaders
CP : Consistency Ratio

Based on the results of the priority recapitulation of the security management criteria above, the consistency ratio (CR) is all <0.1, which means that the pairwise comparison results are consistent. The priority order of criteria from the table above is community involvement with a weight of 0.40, human resources with a weight of 0.29, duration with a weight of 0.15, costs with a weight of 0.10, and deterrence with the lowest weight of 0.06. This shows that the community has a very important and crucial role in securing and sustaining the operation of the Dieng GPPs as a National Vital Object.

Community involvement in security management is very important because of the uniqueness of the Dieng GPPs, which is located close to residential areas and tourist areas that have the potential to cause threats and disturbances from the community and tourists. Community involvement is needed to jointly maintain and secure the National Vital Object so that it can operate without threats and disturbances that can harm related stakeholders, including the community itself.

Geodipa, as the manager of the Dieng GPPs as a National Vital Object, needs to consider the involvement of the community in developing security management strategies and programs. This will indirectly form a paradigm that the company is very aware of the existence of the community as a partner in supporting the operation of the Dieng GPPs, so that the community will feel responsible and participate in maintaining the security of the National Vital Object (sense of belonging).

3.2. Grand Priority *Assessment*

The *grand priority* assessment is the result of alternative weighting as a security approach to each criterion in security management. This assessment aims to look at the alternative priority levels for each of the criteria tested. By the same calculation method as in table 2, the *consistency ratio* (CR) value in table 3 is obtained which is less than 0.1 (CR<0.1). The *grand priority* assessment can be seen in table 3.

Table 2. Weighting of Grand Priority Values

Alternatif	Criteria					Average
	B	SDM	DT	D	KM	
Preemtive	0.47	0.56	0.38	0.47	0.55	0.49
Preventive	0.32	0.19	0.44	0.18	0.26	0.28
Repressive	0.21	0.25	0.18	0.35	0.19	0.24

Cost indicates the level of costs both in the form of material and non-material expenses incurred by the company in minimizing threats and disturbances. The highest weight indicates a security approach that requires less cost. In terms of cost, the preemptive security approach has a weight of 0.47, preventive with a weight of 0.32, and repressive with a weight of 0.21. So, the least cost-effective security approach is preemptive. This is because the cost required for a preemptive security approach is lower than the preventive security approach such as the construction of fences and the procurement of facilities and infrastructure used in carrying out security, the procurement of security personnel to carry out (1) regulation of activities, human traffic, valuable goods, dangerous goods, services and information. (2) guard at the location to anticipate the occurrence of violations or crimes. (3) escorting people, goods, documents, and vehicles entering/exiting the Obvitnas environment. (4) periodic patrols in the large area of the Dieng PLTP, as well as repressive security approaches such as dealing with events or incidents through a coaching process carried out jointly by the Police and/or certain parties whose duties and authority are with Geodipa, including in implementing the cooperation agreement between the parties and Geodipa.

Human resources indicate the level of personnel needs (quality and quantity) or effort (*effort*) needed to minimize threats and disturbances [24]-[29]. The highest weight indicates the security approach that requires the least personnel or effort (*effortless*). In the human resource aspect, the preemptive security approach has a weight of 0.56, preventive with a weight of 0.19 and repressive with a weight of 0.25. So, the security approach that requires the least personnel or effort is preemptive. This is because coordination, socialization, and building partnerships with the surrounding community can be done by the Company's Management (internal security) and does not require a lot of security personnel. Meanwhile, the preventive security approach requires a lot of security personnel (usually from third parties/*outsourcing*) to carry out arrangements, guards, escorts and patrols, and the repressive security approach requires the assistance of the Police in terms of law enforcement.

Deterrence indicates the level of ability to ward off potential threats and disturbances. The highest weight indicates the best security approach in counteracting potential threats and intrusions. In terms of resilience, the preemptive security approach has a weight of 0.38, preventive with a weight of 0.44, and repressive with a weight of 0.18. So, the security approach that has the best ability to ward off potential threats and disturbances is preventive. This is due to the dynamic human character. The preemptive security approach is carried out to eliminate the intention of someone to take actions that can interfere with the operations of Obvitnas.

Although efforts such as coordination, socialization, and partnership with the community have been made, it is possible that the potential for the emergence of an intention to commit criminal acts or violations will still exist for certain reasons such as low legal knowledge, the existence of the interests of a person or group to obtain certain benefits and the existence of mutual beliefs that arise from a sense of solidarity [30]-[34]. Based on this, efforts are needed that can cut off the opportunity for someone who intends to interfere with the operations of Obvitnas, namely, through preventive security approaches such as installing fences, CCTV, warning boards, conducting guards and patrols. Meanwhile, the repressive security approach itself is a response

in the event of a criminal act or violation, so it cannot describe the deterrence at the time of the incident. However, a repressive security approach can have a deterrent effect on perpetrators after a criminal act or violation is committed.

Duration shows which security approaches have a long-term effect on minimizing threats and disruptions. The highest weights indicate the safeguarding approach has a better long-term effect. In terms of duration, the preemptive security approach has a weight of 0.47, preventive with a weight of 0.18, and repressive with a weight of 0.35. So, the safeguarding approach that has the best long-term effects is preemptive. As explained earlier, the biggest potential threats and disturbances to the Dieng PLTP can come from the community and/or tourists. Preemptive security approaches such as coordination, socialization, and partnership with the community through *community development* or CSR programs will provide benefits to the community itself, thereby fostering a sense of ownership and responsibility to maintain the security of Obvitnas. The repressive security approach has more long-term effects than preventive ones, because the existence of law enforcement makes the community and/or tourists more avoidable from committing crimes or violations (deterrent effect). Meanwhile, the preventive approach focuses more on the procurement of personnel who have the potential to be careless in carrying out their duties as Obvitnas security personnel, as well as the procurement of security facilities and infrastructure that have the potential to be damaged and require periodic maintenance (depending on the time).

Community involvement shows the level of community contribution in minimizing threats and disturbances. The highest weight indicates the best level of community contribution. In terms of community involvement, the preemptive preemptive approach has a weight of 0.55, preventive with a weight of 0.26, and repressive with a weight of 0.19. So, the security approach that has the best contribution of community involvement is preemptive. This is because the preemptive security approach focuses on the community as a subject in implementing and supporting the security of Obvitnas, meaning that the community is involved and participates in creating security around the Dieng PLTP. Coordination, socialization, and partnership with the community are efforts to invite the community around Obvitnas to jointly maintain security and order around the Obvitnas environment. Meanwhile, the preventive and repressive security approaches focus more on internal and external security personnel as the subjects who carry out security, so that public involvement in this approach is very small.

3.3. Global Priority *Assessment*

The *global priority assessment* is the result of the multiplication of the matrix between the weight of the alternative value and the criteria being tested. *Global priority* aims to see the level of priority for the criteria and alternatives tested against the goal (*Goal*). The *global priority* assessment can be seen in tables 4 and 5.

Table 4. Alternative Priorities Recapitulation

Responden	Prioritas Alternatif		
	I	II	III
MP 1	PE	PV	RP
MP 2	PE	PV	RP
MP 3	PV	PE	RP
PP 1	PE	RP	PV
PP 2	PE	RP	PV
PP 3	PE	RP	PV
TM 1	PE	PV	RP
TM 2	PE	RP	PV
TM 3	PE	RP	PV
Prioritas	PE	RP	PV

The results of the recapitulation in table 4 show that the preemptive security approach is the first choice for all respondent groups. The preventive security approach is the second choice for the Company Management group and some community leaders, and the repressive security approach is the last choice. Meanwhile, for the Security Personnel group and some community leaders, the repressive approach is the second choice and the preventive security approach is the last choice.

Table 5. Global Priority *Assessment Recap*

Responden	Bobot Prioritas Alternatif			Total
	PE	PV	RP	
MP 1	0.44	0.35	0.21	1
MP 2	0.59	0.29	0.12	1
MP 3	0.34	0.51	0.15	1
PP 1	0.53	0.14	0.33	1
PP 2	0.57	0.07	0.36	1
PP 3	0.62	0.06	0.32	1
TM 1	0.60	0.32	0.08	1
TM 2	0.42	0.21	0.37	1
TM 3	0.69	0.12	0.19	1
Total	4.8	2.07	2.13	9
Prioritas	53.33%	23.00%	23,67%	100%

In Table 5, the differences in the Total Priority Value (TPV) between the various security approach priorities can be observed, with the preemptive approach having a weight of 53.33%, the preventive approach 23.00%, and the repressive approach 23.67%. Based on the recapitulation of alternatives (Table 4) and the grand priority assessment (Table 5), the first priority in the security approach for the Dieng GPPs as a National Vital Object is the preemptive approach, followed by the repressive approach as the second priority, and the preventive approach as the last. The selection of the preemptive security approach as the top priority aligns with studies, the preemptive approach as the most preferred priority [35]-[37]. This approach aims to encourage active participation from the community and tourists in jointly maintaining security and order around the National Vital Object.

A significant portion of threats and disturbances originates from the community, often due to a lack of understanding or adherence to regulations regarding the National Vital Object. Therefore, socialization efforts targeting the community are essential to involve them in safeguarding the National Vital Object [38]-[41]. Preemptive efforts such as socialization provide the public and tourists with an understanding of the importance of maintaining security and order, thereby supporting the continuity of operations at the Dieng GPPs. Moreover, partnership and community programs aimed at local residents can have positive impacts on economic, social, and religious well-being, fostering a sense of ownership (sense of belonging) among the community toward the Dieng GPPs.

Geodipa, as the manager of the Dieng GPPs as a National Vital Object, needs to consider allocating the security budget to preemptive security programs. This study becomes particularly interesting because the second priority in the security approach at the Dieng GPPs is the repressive approach. Typically, the repressive approach is considered the last resort in security efforts. However, in Table 4, respondents who selected the repressive approach as the second priority were predominantly Security Personnel and some Community Leaders. This can be understood as Security Personnel prioritize law enforcement to create a deterrent effect on violators. On the other hand, Community Leaders prefer the repressive approach over the preventive one because the Dieng GPPs, located in a tourist area, frequently attract visitors from outside Dieng. Community Leaders emphasize law enforcement on outsiders to ensure they do not disrupt the operations of the Dieng GPPs, which have contributed to the community through community development programs.

The facilities at the Dieng GPPs, such as steam wells and water injection wells, are scattered over a wide area. Additionally, the steam and water pipeline routes traverse areas near residential neighborhoods, tourist sites, and community farmland. Comprehensive preventive measures, such as fencing the entire pipeline route, which ideally should not be accessed by humans or animals, would incur prohibitive costs. Strengthening community security and order in handling National Vital Objects is often successfully achieved through repressive measures or law enforcement [42]-[45].

3.4. Tourism Integration in Security Management for Dieng GPPs

Tourism in the Dieng Plateau is a significant economic driver, attracting visitors to its cultural and natural attractions [46]-[48]. However, the proximity of geothermal infrastructure to these tourist areas presents challenges and opportunities for security management. The presence of tourists increases the risk of disturbances and accidental breaches but also offers an avenue for fostering community engagement in maintaining security.

Preemptive measures play a crucial role in ensuring tourism security in geothermal areas. Public awareness campaigns, such as educational boards, guided tours, and outreach programs, help inform tourists about the significance of geothermal infrastructure, reducing risks and encouraging responsible behavior. Community involvement programs further enhance safety by empowering locals as hosts and security partners,

with training initiatives that equip them as tour guides or rangers to strengthen their roles. Additionally, designated tourist zones effectively minimize risks by restricting access to high-security areas, ensuring visitor safety while maintaining the integrity of geothermal operations [49]-[51].

Tourism and geothermal operations in the Dieng Plateau present opportunities for synergy through sustainable economic integration. Tourism revenues can be reinvested into community development programs, environmental conservation, and enhanced security infrastructure, fostering a positive feedback loop that benefits both sectors. However, integrating tourism and security poses significant challenges, including balancing accessibility with safety, managing diverse stakeholder interests, and ensuring efficient resource allocation. Addressing these challenges requires strategic planning and collaboration to harmonize tourism growth with the security needs of geothermal operations.

This study presents a novel approach by integrating security management for National Vital Objects (Obvitnas) with the principles of sustainable tourism development, specifically applied to the Dieng Geothermal Power Plant (GPP). Unlike previous research that focused primarily on technical or economic aspects, this study proposes a community-centered security framework, utilizing the Analytical Hierarchy Process (AHP) to prioritize strategies and emphasizing the synergy between security, community empowerment, and tourism growth. The implications of the findings suggest that preemptive security approaches—centered on community involvement, partnerships, and educational outreach—should be prioritized to effectively safeguard vital infrastructure without hindering, and even supporting, local socio-economic development. Practically, this means that security management should transition from traditional enforcement-focused models to inclusive, participatory frameworks that engage local communities as active partners in maintaining site safety. However, the study is limited by its reliance on qualitative data from a relatively narrow group of stakeholders (company management, security personnel, and community leaders), which may not fully capture the perspectives of tourists, unaffiliated residents, or local authorities. Moreover, focusing only on the Dieng GPPs restricts the generalizability of the findings to other Obvitnas with different contexts. The use of AHP, while systematic, also introduces subjectivity based on stakeholder perceptions that may shift over time. Therefore, it is recommended that future research involve a broader range of stakeholders, including tourists and local businesses, to enrich the understanding of security dynamics. Quantitative validation methods should also be employed to assess the actual effectiveness of preemptive programs, and efforts should be made to adapt and test the proposed framework across other types of vital infrastructure. Longitudinal studies are encouraged to monitor the sustainability and evolution of security-tourism integration strategies over time.

4. CONCLUSION

Based on the results of the study, several important conclusions and implications can be drawn regarding the security management strategy at the Dieng Geothermal Power Plant (GPP), operated by Geodipa. First, the priority ranking of the five key criteria in security management places community involvement as the highest priority, followed by human resources, duration, cost, and deterrence. This finding highlights the critical importance of involving the local community in every security program and strategy. Given the unique characteristics of the Dieng GPP — its location near residential areas and tourist sites — community engagement is essential to building trust, enhancing early detection of potential threats, and fostering a collaborative security culture. Geodipa must therefore ensure that all security initiatives are participatory, inclusive, and sensitive to local social dynamics. Second, regarding security approaches, a preemptive security strategy emerged as the top priority across all respondent groups, followed by repressive and then preventive approaches. This indicates that Geodipa should focus its resources on proactive measures, such as risk identification, early intervention, education, and community outreach, rather than relying primarily on reactive or enforcement-based strategies. A larger portion of the security budget should be allocated to preemptive programs that anticipate and neutralize risks before they escalate. Although repressive and preventive approaches still play important supporting roles, their prioritization should be adjusted according to the stakeholder profile and local context. Third, the increasing importance of tourism in the Dieng area introduces a new dimension to security management. To ensure the sustainable operation of the GPP while supporting local economic development, there must be a strategic synergy between tourism and security efforts. Public education programs for both residents and visitors, as well as the active involvement of the tourism sector in security initiatives, can significantly contribute to a safer and more resilient environment. Geodipa should therefore design integrated strategies that simultaneously enhance site security and promote responsible, sustainable tourism practices.

Qualitatively, these findings imply that effective security management at a National Vital Object like Dieng GPP requires a holistic, community-centered, and future-oriented approach. The success of security operations will not depend solely on technical measures or law enforcement but also on social engagement, education, and cross-sector collaboration. Future research should explore deeper models of community-based security management and analyze the evolving interaction between tourism growth and security demands in similar contexts.

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