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Strategic Environmental Policy Analysis in Gunung Mas Regency, Central Kalimantan

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ABSTRACT

This study aims to analyze the integration of strategic environmental policies into development planning in Gunung Mas Regency, Central Kalimantan, by highlighting the effectiveness of the implementation of Strategic Environmental Assessment (KLHS) in the Regional Medium-Term Development Plan (RPJMD). Using a prospective approach based on SMIC-PROB Expert, this study evaluates the most likely policy scenarios and their systemic impacts on sustainable development. Simulation results indicate that the stagnant scenario (00000) has the highest probability of 53.4%, reflecting weak integration and synergy across sectors. Sensitivity and dependency analyses indicate that strengthening sustainable agricultural systems is the most influential variable, while community-based ecotourism development is the most dependent. This study recommends reformulating regional policies by placing KLHS as the primary instrument, improving environmental governance based on spatial data, and developing five priority interventions: land and forest rehabilitation, sustainable agriculture, community ecotourism, green infrastructure, and integrated waste and sewage management. This study emphasizes the need for policy transformation from a normative-sectoral approach to a systemic, mission-driven, and inclusive strategy to achieve low-carbon and sustainable development at the regional level.

Keyword: **Environmental policy, Prospective, Ecotourism.**

ABSTRAK

Kajian ini bertujuan untuk menganalisis integrasi kebijakan lingkungan hidup strategis dalam perencanaan pembangunan di Kabupaten Gunung Mas, Kalimantan Tengah, dengan menyoroti efektivitas penerapan Kajian Lingkungan Hidup Strategis (KLHS) dalam dokumen Rencana Pembangunan Jangka Menengah Daerah (RPJMD). Menggunakan pendekatan prospektif berbasis SMIC-PROB Expert, penelitian ini mengevaluasi skenario kebijakan yang paling mungkin terjadi dan dampak sistemiknya terhadap pembangunan berkelanjutan. Hasil simulasi menunjukkan bahwa skenario stagnan (00000) memiliki probabilitas tertinggi sebesar 53,4%, mencerminkan lemahnya integrasi dan sinergi lintas sektor. Analisis sensitivitas dan dependensi menunjukkan bahwa penguatan sistem pertanian berkelanjutan merupakan variabel paling berpengaruh, sedangkan pengembangan ekowisata berbasis komunitas adalah yang paling bergantung. Studi ini merekomendasikan reformulasi kebijakan daerah dengan menempatkan KLHS sebagai instrumen utama, peningkatan tata kelola lingkungan berbasis data spasial, serta pengembangan lima intervensi prioritas: rehabilitasi lahan dan hutan, pertanian berkelanjutan, ekowisata komunitas, infrastruktur hijau, serta manajemen sampah dan limbah terpadu. Penelitian ini menegaskan perlunya transformasi kebijakan dari pendekatan

normatif-sektoral menuju strategi sistemik, misi-driven, dan inklusif guna mewujudkan pembangunan rendah karbon dan berkelanjutan di tingkat daerah.
Keyword: Kebijakan lingkungan, Prospektif, Ekowisata.

1. Introduction

Global attention has been widely devoted to reframing persistent and intractable social and economic challenges as opportunities to drive policy reform. This is particularly evident in the global 2030 Agenda and the Sustainable Development Goals (SDGs), which represent a shared vision for a sustainable future for all by setting 17 interconnected goals with 169 targets and 231 indicators, to guide national policies across economic, social, and environmental fields. Since ratification in 2015, national governments have integrated these goals into planning processes and policies. However, the challenges in influencing change in multi-level governance systems demonstrate the importance of collective efforts and effective coordination among stakeholders in local-based development policies, the process of translating, implementing, and monitoring the SDGs at the local level.

Currently, researchers have advocated for local governments to adopt policy approaches that are more relevant to local-based development policies—approaches that are experimental and allow them to drive "paths of innovation and collaboration". Mission-oriented policies that aim to address systemic failures such as lack of direction, limited reflexivity, and lack of coordination provide comprehensive guidance for the development and implementation of policies related to Sustainable Development. However, empirical studies on linking mission-oriented policy thinking and local-based development are limited. Researchers argue that it is time for critical reflection and to provide rigorous academic attention to the concept of localizing sustainability missions.

In this context, the study critically explores the benefits of mission-oriented policy thinking in addressing directional challenges in localizing SDGs into strategic city plans. The model developed by Bergek et al. (2023) argues that formative and applicative approaches to unraveling directionality challenges in practice include four main dimensions of the policy agenda: goals, logic, domains, and leverage. Meanwhile, the typology of institutional production adopted for sustainability includes six main areas: novelty, absorption, dismantling, stability, and interaction. This typology serves as a useful theoretical starting point for assessing existing development directions, points of progress, and the deadlocks of existing local-based development practices, without defining the final endpoint of the process. The SDG localization process is fundamentally linked to the process of remaking local institutions for transition.

Sustainability missions play a vital role in facilitating narrative building across sustainability policy efforts, aiming to bring critical attention to the concept of sustainability missions and their ability to drive cohesive narratives in local-based development policies. As the practice of embedding mission-oriented paradigms into policymaking is a relatively new phenomenon, this paper seeks to provide timely insights into the practical implementation and impact of missions, such as the SDGs.

Gunung Mas Regency is one of the areas in Central Kalimantan Province known for having wealth in natural resources, especially tropical forests, peatlands, and mineral reserves such as gold. However, this potential becomes a paradox when not accompanied by strong environmental policies and sustainable implementation. The massive activity of unlicensed gold mining (PETI), the expansion of land for the food estate program, and the weak supervision of land conversion have caused serious ecological damage in this region. Studies confirm that PETI countermeasure policies in the Sepang District, Gunung Mas, experience serious obstacles in implementation, ranging from weak coordination between agencies and limited supervision capacity to non-optimal law enforcement against illegal actors.

Since the enactment of regional autonomy, regency governments have had great authority in determining the direction of development policy, including in terms of managing natural resources and the environment. Nevertheless, in practice, many regions including Gunung Mas have not fully integrated sustainability principles into regional planning and budgeting documents. Low community involvement in the spatial planning process, as seen in Upon Batu Village, causes many development projects to lack social legitimacy and often triggers agrarian conflicts and environmental degradation. This reinforces the importance of compiling strategic environmental policies based on participation and valid spatial data.

The direct impact of weak environmental policies is visible from the destruction of forest areas, river pollution, and the decline in the quality of biodiversity. The national food estate project implemented in this

region has resulted in the massive conversion of tropical forests and the intensive use of chemical fertilizers, which directly affects the loss of endemic species and the emergence of conflicts between indigenous peoples and plantation corporations. Furthermore, it is noted that the control of environmental damage due to small-scale gold mining in Gunung Mas does not yet have a consistent policy direction. The absence of ecological vulnerability maps and weak administrative sanctions against rogue companies worsen the environmental condition.

Environmental policy cannot stand alone without synergy between stakeholders: local governments, indigenous communities, academics, the business world, and environmental NGOs. In Gunung Mas, there are major obstacles in building collaborative governance due to limited ecological literacy among regional officials and weak participatory mechanisms in the preparation of environmental documents such as KLHS and AMDAL. The lack of coordination between departments and the minimum of valid data regarding the impact of mining make the resulting policies tend to be reactive and short-term in nature. Therefore, a systemic approach is needed through strategic environmental assessment (SEA/KLHS) analysis to build a foundation for long-term sustainable planning.

One of the main challenges in mainstreaming strategic environmental policies in Gunung Mas is the non-optimal integration of Strategic Environmental Assessment (KLHS) into the RPJMD (Regional Medium-Term Development Plan) document. In fact, KLHS is a legal and normative prerequisite in Law No. 32 of 2009 concerning Environmental Protection and Management. The Gunung Mas RPJMD documents in previous years tended to focus on physical and economic targets (road infrastructure, agricultural production, economic growth) without clear environmental indicators. This is because KLHS is only treated as an administrative supplement, not a substantive guide in the planning process.

The approach of environmental ethics can also be integrated into policy formulation in Gunung Mas, especially concerning Muslim communities directly affected by deforestation or flash floods. Using the Maqashid Sharia approach, researchers highlight that forest destruction in the food estate project contradicts the principles of protection of life (hifz al-nafs), offspring (hifz al-nasl), and property (hifz al-mal). Thus, based on the description above, there is a need for policy breakthroughs in realizing sustainable development in Gunung Mas Regency. A study of several policy options is very appropriately required and is an urgent need that demands an interdisciplinary, participatory, and data-based approach.

2. Method

To analyze strategic environmental policies in Gunung Mas Regency oriented towards the mission of the Sustainable Development Goals so that they can be useful in informing the direction of policy and local-based institutional governance, this study adopts a computational quantitative research design.7 The study uses the case study of Gunung Mas Regency. The primary and secondary data used in this study include primary data collected through in-depth interviews with 4 key informants who have roles in policy expertise. Secondary data were collected through a desk study and gathered from several related agencies, publications, and other related documents that support the research objectives.

Policy alternatives formulated are the result of development policies carried out in Gunung Mas Regency, where the recommended policy alternatives are analyzed computationally with SMIC-PROB Expert, which has the smallest closeness value occupying the top rank (less than 0.50).7 Prospective analysis is one of the approaches used for policy analysis, specifically through the SMIC-PROB Expert Analysis or expert approach. In SMIC-Prob, a combination score of scenarios that are possible to implement is calculated, where the number of scenarios or events observed is of the magnitude: $r = 2^n$. where ''n'' is the number of scenarios observed. The scenario with the highest probability score (%) will be used as the recommended scenario in the research. This method allows for a structured evaluation of future uncertainties by integrating the subjective probabilities provided by domain experts into a cross-impact matrix system that ensures internal consistency.

3. Result and Discussion

Gunung Mas Regency in Central Kalimantan faces complex environmental pressures. Wealth in natural resources such as tropical forests, peatlands, and mineral reserves precisely becomes a source of ecological conflict. Unlicensed gold mining (PETI) activities, food estate expansion, and weak environmental governance have caused significant degradation of biodiversity and water resources. Previous studies underline that PETI countermeasure policies are hindered by weak inter-institutional coordination and ineffective law enforcement.

Results of interviews with key informants show that environmental policy has not yet become a strategic priority in regional planning documents. The Gunung Mas RPJMD tends to focus on macro-economic indicators such as GRDP growth and physical infrastructure development, while the ecological dimension is ignored or only used as an administrative supplement, not as a substantive basis in decision-making. As found

in other studies, KLHS is only treated as a normative obligation, not as a strategic tool that influences the direction of development.

Using a mission-oriented approach, this study assesses that strategic environmental policy in Gunung Mas does not yet have a clear direction, is not yet reflective of local complexities, and lacks institutional innovation. The integration of Sustainable Development Goals (SDGs) has not been tangibly reflected in regional development priorities. In fact, SDGs are not only global indicators but also offer a policy framework that is holistic, participatory, and measurable. One of the important findings in this research is the non-optimal integration of KLHS into the RPJMD document of Gunung Mas Regency. Even though Law No. 32 of 2009 clearly mandates the use of KLHS as a basis in the preparation of the RPJMD. The absence of operational environmental indicators makes development programs lose their ecological direction. The absence of ecological vulnerability maps and cross-sector impact analysis causes environmental policies taken to be reactive and short-term, not based on data and long-term predictions.

Based on the findings in the field, the formulated recommendations aim to encourage environmental preservation while increasing the welfare of the local community through various initiatives such as reforestation, organic farming training, green infrastructure development, to the digitalization of public services. With proper implementation and sustainable strategies, these steps are expected to be able to create a Gunung Mas Regency that is more advanced, modern, and balanced ecologically and socially.

The following are recommendations in decision-making for policies, plans, and/or programs for the preparation of the Gunung Mas Regency RPJMD:

1. **Land Rehabilitation and Sustainable Forest Management**
   Goals: To restore forest ecosystems and increase the welfare of the local community.
   Recommended Programs:
   - Agroforestry-based reforestation with local plants of economic value.
   - Community training in sustainable forest management.
   - Establishment of community-based conservation zones.
2. **Strengthening Sustainable Agricultural Systems**
   Goals: To increase food security and farmers' welfare through environmentally friendly techniques.
   Recommended Programs:
   - Farmer training on organic farming and climate change adaptation.
   - Provision of water-saving technology and organic fertilizers.
   - Digitalization of agricultural product marketing and integration into national/international markets.
3. **Development of Community-Based Ecotourism**
   Goals: To develop environmentally friendly tourism to support the local economy.
   Recommended Programs:
   - Building tourism destinations based on local ecosystems.
   - Involving the community as tour guides, business actors, and destination managers.
   - Education programs to increase tourists' awareness about conservation.
4. **Sustainable Infrastructure and Green Transportation Systems**
   Goals: To ensure infrastructure development does not damage the ecosystem
   Recommended Programs:
   - Road construction with ecological corridors to protect wildlife.
   - Application of renewable energy-based transportation such as electric buses.
   - Use of GIS technology for environmental impact mitigation during construction
5. **Integrated Waste and Sewage Management**
   Goals: To reduce environmental pollution due to domestic and industrial waste.
   Recommended Programs:
   - Construction of modern waste processing facilities (composting, plastic recycling).
   - Industrial waste regulation with strict sanctions for violations.
   - "Zero Waste" campaign to increase community awareness.

Through a prospective approach and SMIC-PROB Expert analysis, this study successfully identified several policy scenarios that are most likely and have a high impact to be implemented. The best scenario combination is selected based on a closeness value of < 0.50, which indicates alignment between probability and implementation impact. The priority of policy alternatives in sustainable development is obtained from the results of probability analysis. The meaning of sustainability is ensuring that development efforts to meet current needs do not compromise the ability of future generations to meet their own needs in their time. The results of the analysis show that alternative policies related to Strategic Environmental Policies in Gunung Mas Regency relate to aspects of risk and uncertainty. Policy makers can use alternative policies by first using probability analysis to determine the policies to be applied in the future time period.

3.1 Probability Analysis of Implementing Policy Alternatives

The policy alternatives that will be analyzed are only on five main priority policy alternatives, namely policies related to: Land Rehabilitation and Sustainable Forest Management (Hypothesis 1), Strengthening Sustainable Agricultural Systems (Hypothesis 2), Development of Community-Based Ecotourism (Hypothesis 3), Sustainable Infrastructure and Green Transportation Systems (Hypothesis 4), Integrated Waste and Sewage Management (Hypothesis 5). The probability analysis carried out will provide opportunities for policy scenarios by combining scenario hypotheses, whether realized or not according to the decision-maker's opportunity and the opportunity of an individual in certain conditions. The following are the results of the Strategic Environmental Policy analysis in Gunung Mas Regency based on the probability image of the combination of various hypotheses:

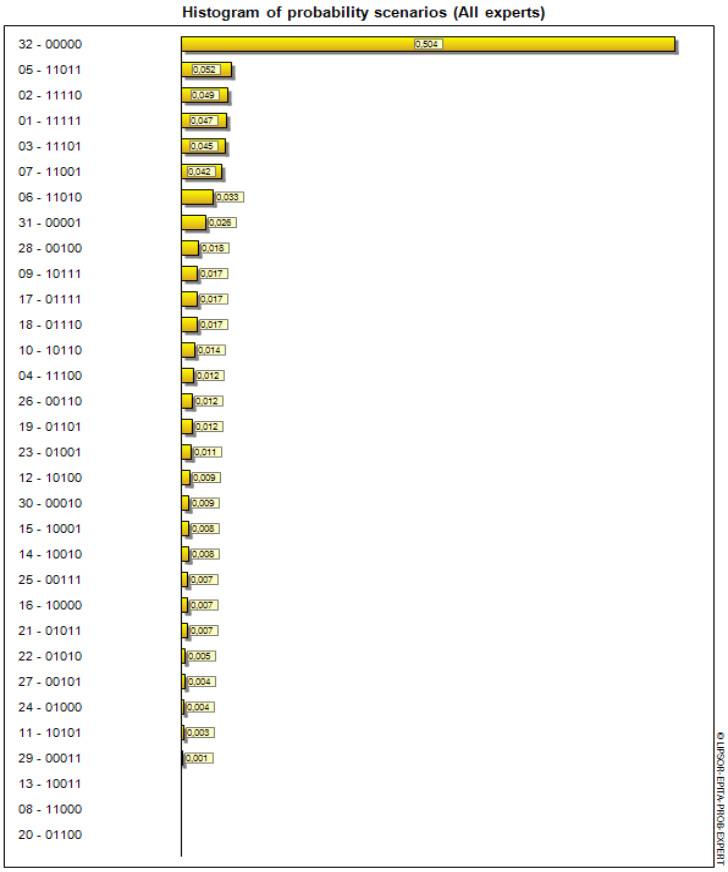

Figure 1: Probability of Combining Different Hypotheses

The results of the combination scenario opportunity show combinations as many as 2^n, where 'n' is the number of events or scenarios of the Strategic Environmental Policy in Gunung Mas Regency. The combinations produced are 32. The numbers "1" and "0" in each combination indicate whether the scenario is realized or not. In the table above, combination thirty-two (32) namely Scenario 32-00000 with the highest probability value of 0.534 or 53.4% means that experts assess that in current conditions, the greatest possibility is the non-achievement of all expected indicators (all zeros). This reflects the status quo where no strategic

policy initiatives have been successfully run effectively, or the system is still working partially and sectorally without synergy.

Another Potential Scenario, namely Scenario 05-11011 with a probability of 0.052, is the next highest after the zero scenario. Subsequent scenarios such as 02-11110 (0.049) and 01-11111 (0.047) show that there is an opportunity for partial success if some main variables are run simultaneously. This indicates that although the dominance of the failure scenario probability is quite high, there are realistic opportunities for change if policies are implemented with better coordination and synergy.

3.2 Analisis Sensitivitas

Sensitivity analysis is used by policymakers to obtain information if there are changes in the policy scenarios to be carried out. This analysis can identify the policy that most influences the success of other policies (influence) and the policy that has the most dependence on other policies (dependence). Every scenario obtained from the results of probability sensitivity analysis shows that each policy combination has negative and positive values. A negative value means that there is a relationship that does not complement each other in each policy alternative. This further shows that the increase in the probability of Strategic Environmental Policy in Gunung Mas Regency follows the Matrix of Sensitivity Analysis Results below:

	Rehabilitasi Lahan dan Pengelolaan Hutan Berkelanjutan	Penguatan Sistem Pertanian Berkelanjutan	Pengembangan Ekowisata Berbasis Komunitas	Infrastruktur Berkelanjutan dan Sistem Transportasi Hijau	Manajemen Sampah dan Limbah Terpadu	Absolute value
1 : Rehabilitasi Lahan dan Pengelolaan Hutan Berkelanjutan	1	0,272	0,238	0,269	0,245	1,025
2 : Penguatan Sistem Pertanian Berkelanjutan	0,332	1	0,345	0,377	0,305	1,359
3 : Pengembangan Ekowisata Berbasis Komunitas	0,105	0,106	1	0,149	0,088	0,448
4 : Infrastruktur Berkelanjutan dan Sistem Transportasi Hijau	0,15	0,151	0,174	1	0,085	0,56
5 : Manajemen Sampah dan Limbah Terpadu	0,136	0,159	0,109	0,085	1	0,489
6 : Absolute value	0,724	0,689	0,865	0,879	0,724	_

Figure 2: Matrix of Sensitivity Analysis Results

Description:

Hypotheses	H1	H2	H3	H4	H5	Influence (Total)
H1: Forest Management	1	0.272	0.238	0.269	0.245	1.025
H2: Agriculture	0.332	1	0.345	0.377	0.305	**1.359**
H3: Ecotourism	0.105	0.106	1	0.149	0.088	0.448
H4: Infrastructure	0.150	0.151	0.174	1	0.085	0.560
H5: Waste/Sewage	0.136	0.159	0.109	0.085	1	0.489
Dependence (Total)	0.724	0.689	**0.865**	**0.879**	0.724	

The matrix above shows the dependency matrix between hypotheses or policies (Dependency Matrix), which is used to measure the level of influencing and being influenced between scenario variables. This matrix is very useful in identifying key variables in a scenario-based strategic planning system. Strengthening Sustainable Agricultural Systems (H2) has the highest total outgoing influence score = 1.359, making it the variable that most influences other hypotheses. This shows that strengthening the agricultural sector triggers systemic changes in other fields.

On the Hypothesis Most Influenced (Dependent), Hypothesis 4 (Sustainable Infrastructure) and Hypothesis 3 (Community-Based Ecotourism) receive the highest cumulative influence scores, 0.879 and 0.865 respectively. This means that ecotourism development is highly dependent on the success of other

sectors, such as Land Rehabilitation and Sustainable Forest Management, Strengthening Sustainable Agricultural Systems, Sustainable Infrastructure, and Integrated Waste Management

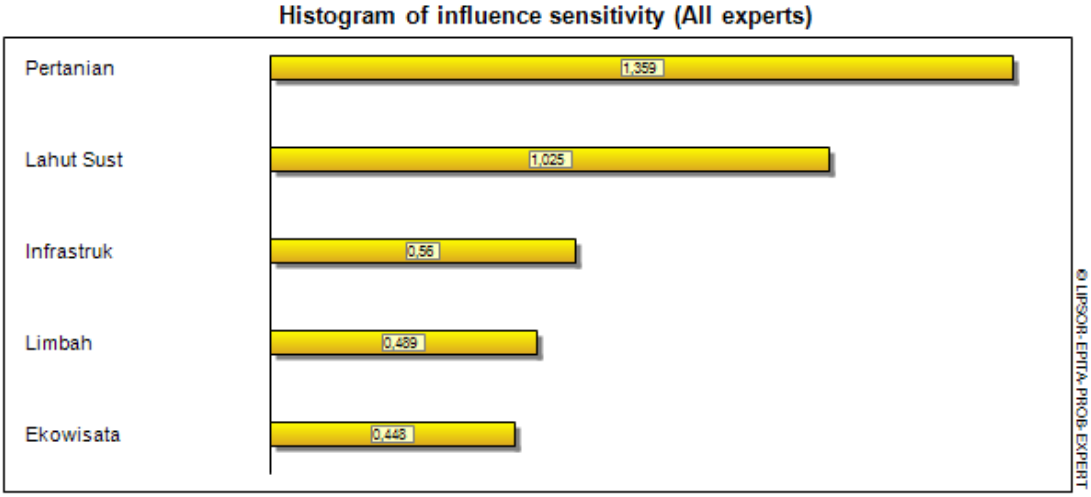

Figure 3: Sensitivity Analysis for Policy Alternatives that Have an Influence

The policy alternatives that most influence (influence) the Strategic Environmental Policy in Gunung Mas Regency are policies related to Strengthening Sustainable Agricultural Systems, as seen in the Histogram of Influence Sensitivity. Based on the sensitivity analysis results, it is obtained that the alternative policy with the highest dependence is the Community-Based Ecotourism Development policy (Hypothesis 3) at 0.865. These results indicate that the policy alternative has the highest level of dependence on the success of other policy alternatives.

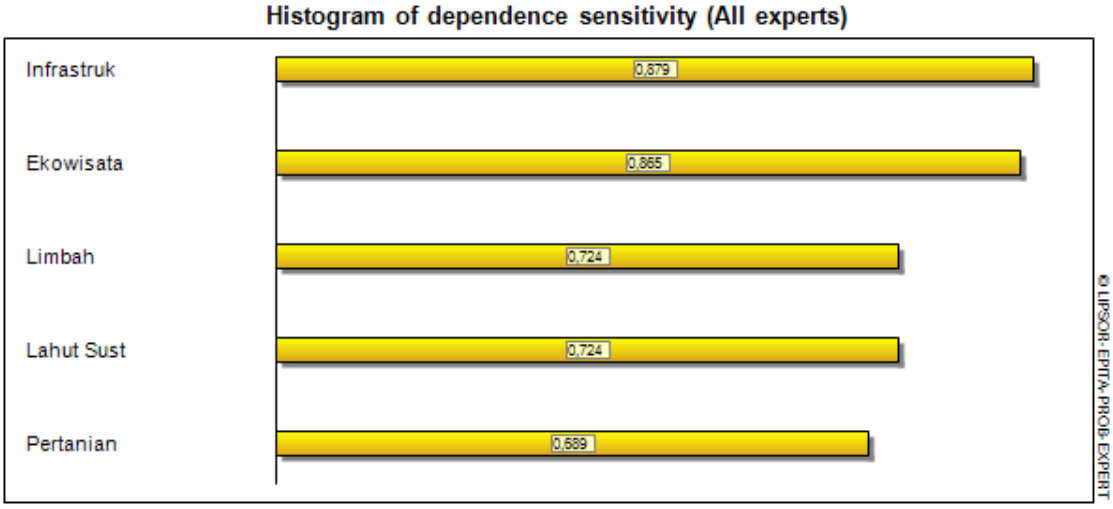

Figure 4: Sensitivity Analysis for Policy Alternatives with Dependencies

The high dependence of Community-Based Ecotourism Development on other policies illustrates that improving the conditions for ecotourism is not an easy task because it requires cross-sectoral roles and linkages. Local-level sustainable development policy is largely determined by a systemic understanding of the interdependence between strategic factors. In the context of Gunung Mas Regency, the Strategic Environmental Assessment (SEA/KLHS) approach becomes an important tool in compiling and evaluating medium-term development plans based on a sustainability mission.

The sustainable infrastructure factor occupies the highest position in the histogram with a dependence value of 0.879, which means that almost all variables in the policy system are highly dependent on the development of this sector. Infrastructure here includes transportation, green energy access, clean water networks, and public facilities based on circular economy and low-carbon principles. High dependence on infrastructure shows that if this aspect is not developed with a sustainability approach, then other policies tend to be ineffective. For example, ecotourism or green agriculture development will stagnate without road infrastructure, communication, and supporting energy. Policy implications for infrastructure must be a priority

intervention in the Gunung Mas RPJMD, including the proportion of green budget and carbon footprint reduction per project.

Ecotourism is in the second rank with a value of 0.865, which indicates that the development system is very dependent on the success of community-based ecotourism development. In areas like Gunung Mas, which have a rich ecological landscape, ecotourism is not only an economic sector but also a conservation instrument. Community-Based Ecotourism (CBET) increases environmental awareness, strengthens social capital, and provides financial incentives for the community to protect the ecosystem. Therefore, ecotourism is a high-leverage policy tool that impacts forest conservation, local culture, and village income.

Integrated waste and sewage management has the third sensitivity of 0.724. This means that the performance of this sector has a large influence on environmental sustainability in general. Unmanaged waste will pollute water and soil and directly impact public health and agricultural productivity. The 3R (Reduce, Reuse, Recycle) approach and circular economy become crucial to answer this challenge. The existence of integrated waste treatment sites, sorting systems at the source, and economic incentives from recycling are keys to success.

Equally high as waste, the land and forest management factor also has a score of 0.724. This is very important considering that a significant portion of the Gunung Mas area still consists of forest cover and peatlands. Land conversion for mining, food estates, and infrastructure without KLHS will be at high risk of losing ecosystem services and triggering agrarian conflicts. Inclusive and participatory forestry governance through village forests and community-based conservation areas is an integrative solution to maintain ecological value and community welfare.

The sustainable agriculture factor shows a value of 0.689, making it the factor with the lowest sensitivity of the five factors. However, although in the last position, this value is still classified as high and significant. Agroecological approaches and crop diversification become important pillars in agricultural development resilient to climate change. In Gunung Mas, agriculture is still largely carried out subsistently and not yet integrated into market value chains or modern technology. Local agricultural departments must encourage the adoption of precision agriculture, water-saving irrigation, and agroecology training based on farmer groups.

High dependence between factors shows that the Gunung Mas development system is interdependent and complexly adaptive. No single sector can run in isolation. Infrastructure must support ecotourism, waste management protects agriculture from pollution, and forest governance determines water availability for agriculture. Therefore, policy strategies must be cross-sectoral and cross-scale, from village to regency, and involve various actors: government, private sector, academics, and civil society. This requires an integrated monitoring system based on spatial data and real-time dashboards to enable early detection of systemic pressures and become a basis for policy adaptation.

4. Conclusion

This study reveals that Gunung Mas Regency faces serious environmental challenges due to the weak integration of sustainability principles in regional development planning. Activities of unlicensed gold mining (PETI), food estate expansion, and forest and peatland degradation worsen social-ecological conflicts that have not been resolved. In previous RPJMD documents, the environmental dimension was not made a substantive priority, but only as an administrative supplement, even though Law No. 32 of 2009 requires the integration of KLHS into strategic planning documents.

Using the SMIC-PROB Expert approach and sensitivity analysis, this study found that the scenario most likely to be realized currently is the "zero" scenario, where all strategic indicators are not achieved (probability 53.4%). This shows that the current policy system is in a status quo, without clear direction and strong inter-sectoral coordination. However, several alternative scenarios show potential for success if implemented simultaneously and in a coordinated manner, such as scenario 05-11011.

In the context of sensitivity, analysis shows that Strengthening Sustainable Agricultural Systems is the policy with the highest influence on other policies. Meanwhile, Community-Based Ecotourism Development is the policy with the highest dependence, indicating that its success is largely determined by other sectors such as infrastructure, forestry, and waste management. Therefore, to achieve sustainable development, Gunung Mas Regency must transform its policy from a normative-sectoral approach toward a systemic, mission-driven, and inclusive strategy that places KLHS as the primary substantive instrument in planning. This transformation must be supported by valid spatial data, community participation, and ethical considerations such as Maqashid Sharia to ensure that development protects life, environment, and social equity for present and future generations.

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