

Policy Formulation Model To Manage Environmental Pollution Caused By Gold Mine Exploitation In Gunung Botak Settlement Area Of Buru Regency, Maluku Province

Bambang Heru Purwanto¹, Yaya Mulyana Abdul Azis², Atika Wael³

¹²³Pasundan University, Bandung, Indonesia

bambangherupurwanto@unpas.ac.id¹, mulyana_yaya@unpas.ac.id², tikahitu@gmail.com³

ABSTRACT

This research is motivated by the weakness of environmental management policies due to the exploitation of the Gunung Botak gold mine, characterized by low coordination and communication, sectoral egos, the absence of regional government initiatives to formulate strategic steps and weak support and commitment to shared awareness in the formulation of environmental management policies in Buru Regency. The research focused on the TBI-Approach theory from Kadji (2016) which includes the dimensions of the top-down approach, bottom-up approach, and integrated approach. The purpose of the research was to analyze the factors that cause weak environmental management policies and the effective formulation model of environmental management policies due to the exploitation of the Gunung Botak gold mine in the residential area of Buru Regency. The research method used is descriptive research with a case study approach. Data collection techniques include in-depth interviews, literature review, and observation. Data analysis uses Soft Systems Methodology (SSM). The results of the study explain that the formulation of environmental pollution control policies due to the exploitation of the Gunung Botak gold mine in the residential area of Buru Regency in the bottom-up approach and integrated approach dimensions is good, while the top-down approach dimension needs attention. The formulation model of effective environmental pollution management policy due to the exploitation of the Gunung Botak gold mine in the residential area of Buru Regency is through strengthening the top down, bottom up and integrated approach dimensions which are strengthened by leadership components as a research novelty in an effort to realize the formulation of effective environmental pollution management policy due to the exploitation of the Gunung Botak gold mine in the residential area of Buru Regency, Maluku Province.

KEYWORDS: policy formulation, gold mining, residential areas

INTRODUCTION

Air, water, and soil pollution are serious problems and negatively impact human health, aquatic and terrestrial life, and overall environmental sustainability. This problem affects nearly every country, including Indonesia in general and Maluku (Aminah, 2022). Maluku Province since the 5th century has been the main source of world spices as well as being iconic in the eyes of sailors of the spice route era, the aroma of Maluku spices can be smelled even tens of miles before the sailors for Malay traders who were amazed by the Maluku islands that could grow nutmeg and cloves only in their region and got their own nickname for the Maluku region from Malay traders namely God created Timor for sandalwood, Banda for nutmeg and Maluku for cloves but now Maluku is no longer the center of spices but Maluku is known for its abundant mining resources (Astuti, 2023).

The geographical position of Maluku province which is located between the meeting of three main plates forming the earth's crust, namely the Eurasian plate (north), the Indo-Australian plate (south) and the Pacific plate (west) is a potential area for the formation of various mineral reserves, geothermal and hydrocarbon basins. Potential mining materials and energy that have the potential to be developed commercially include gold, copper, nickel, limestone, sulfur, petroleum and geothermal energy are found in Buru Regency, Maluku Province. At the end of 2011 since the discovery of gold in Mount Botak, Dafa Village, Wamsaid Hamlet, Waeapo District, Buru Regency, Maluku Province, it has become one of the mining areas visited by many miners from various regions which has caused a multiplier effect on human life.

One of the impacts of gold mining in the Mount Botak area is the decline in water quality, which is usually used for human needs for irrigation and drinking, which can no longer be used due to water turbidity, increased concentrations of heavy metals such as mercury, which are usually found in river bodies due to waste from management (Damar, 2022). Miners do not have the authority/permit to mine, so they carry out activities that do not comply with the regulations that arise. The areas around Mount Botak are also not spared from traditional gold mining activities, including Kaiely Village, located on the coast of Kaiely Bay, approximately 1 kilometer from the mouth of the Wamsait River, which is the main disposal site for hazardous and toxic waste (B3) used from the Mount Botak gold mining. The coast of Kaiely Bay is vulnerable to the process of mercury methylation, the magnification and accumulation of which can reach humans (Deliza, 2021).

Based on the results of the researcher's initial observations, the weak policy formulation regarding the management of environmental pollution due to gold mining exploitation in the Gunung botak residential area of Buru Regency is caused by the following:

1. Mining activities carried out by the community in the Gunung Botak area from 2011-2024 did not have a permit from the local government for illegal mining (PETI), were traditional in nature and were still small in scale, although processing developments experienced rapid changes starting from only using a pan for panning to using drums and mercury to heat gold and non-gold items.
2. The Ministry of Environment and Forestry (KLHK) shows that more than 2,000 hectares of forest on Buru Island were lost in 2018 due to illegal logging to clear land for mining. Water pollution is a major problem, the use of hazardous chemicals such as mercury and cyanide in the mining process pollutes the island's rivers. A 2019 study by the Indonesian Institute of Sciences (LIPI) found that mercury levels in the Waekase River reached 0.05 mg/L, far exceeding the safe threshold set by the WHO of 0.001 mg/L. As a result, the community experienced various serious health problems, including mercury poisoning, which causes neurological and reproductive health disorders.
3. Uncontrolled mining activities have caused soil erosion and landslides. Data from the National Disaster Management Agency (BNPB) in 2020 recorded 15 major landslides that damaged agricultural land, infrastructure, and settlements, and left at least 10 people homeless. Deteriorating air quality has also had a significant impact, with PM2.5 particle levels in the area around the mine reaching 150 $\mu\text{g}/\text{m}^3$ according to measurements by the Ministry of Environment and Forestry in 2019, far above the safe standard set by the WHO of 25 $\mu\text{g}/\text{m}^3$. This air pollution causes respiratory problems for residents, especially children and the elderly. This environmental crisis has impacted the social and economic conditions of the local community. Overall, the spread of illegal gold mining on Buru Island has caused complex and far-reaching environmental damage. Deforestation, water pollution, soil erosion, declining air quality, and severe social and economic impacts are the main problems faced.
4. Miners are generally local residents who work together in groups, with each group systematically dividing up tasks. The mining system generally uses an underground system, using tunnels (adits) and shafts. Gold ore processing is mostly carried out near the mining site, but some is also carried out in the community's own yards.

Pada formulasi kebijakan proses kebijakan publik merupakan tahap yang paling Penting karena implementasi dan evaluasi kebijakan hanya dapat dilaksanakan apabila tahap formulasi kebijakan telah selesai (Erwan, 2016). Permasalahan di dalam masyarakat membutuhkan pemecahan masalah yang tepat dan sesuai dengan karakteristik dan kondisi Masyarakat dalam menentukan kebijakan para aktor untuk mengkaji dengan tepat dan bijaksana agar tidak terjadi komplik dalam masyarakat. Hal ini terkait dengan penyusunan formulasi kebijakan pengelolaan pencemaran lingkungan hidup akibat eksploitasi tambang emas di Gunung Botak kawasan permukiman Kabupaten Buru Provinsi Maluku. Sejak ditemukannya tambang emas di Gunung Botak tahun 2011 sampai sekarang belum adanya kepedulian pemerintah daerah akan kondisi lingkungan hidup di Kawasan permukiman akibat eksploitasi Gunung Botak.

LITERATURE REVIEW

Policy formulation is the earliest process in public policy as a whole. Therefore, what occurs in this phase is crucial for the success or failure of the public policy created in the future (Fermana, 2020). It should also be noted that public policy formulation is oriented towards implementation and evaluation, as policymakers often assume that good public policy formulation is a concept filled with ideal and normative messages. The importance of the formulation process is a crucial starting point for any policy, as it attracts the interests of political actors (Firdaus, 2022). Existing decisions are part of every action taken by the government, whether through issuing policies or similar products, or every government action not to address an issue. Various regulations are formulated by leaders and executives, followed up by the relevant bureaucracy in collaboration with the community (Kurnia, 2024).

This concept suggests that policy implementation failure is part of the duties and responsibilities of the bureaucracy (Roberto, 2021). To ensure a positive public response to public policy implementation, policymakers consistently negotiate directly with the communities impacted by a policy (Muhammad, 2022). Every good policy formulation contains nuances of implementation and benchmarks for success, ensuring that policies formulated and implemented in the form of programs are always aimed at implementation. At the conceptual level, policy formulation not only contains the thoughts or opinions of leaders representing members but also public opinion and the public's voice (Muslihudin, 2022). This is because the policymaking process is essentially never value-free, so various interests always influence the policymaking process. Furthermore, according to Kadji (2016:83), there are three dimensions that need to be considered in efforts to realize policy formulation, namely:

1. Dimension of the Top Down Approach; related to the existence of government, namely: the executive and legislative as institutions in which there are public figures who in their elite capacity are at the level of top leaders, to have: (i) an exemplary attitude, (ii) a spirit that upholds consistency, (iii) commitment to the interests of the people, and (iv) a mindset (change in mindset to a more positive one).
2. Bottom Up-Approach Dimension; explains the existence of the private sector and civil society. In its capacity, civil society can be moved to increase: (i) participation, (ii) as a party that is always at the forefront in showing real expectations for government policies, (iii) efforts by civil society to influence policies as well as break down and carry out rejection (resistance) against every government public policy, and (iv) the level of education (education) of the community in understanding and knowing how important community involvement is in every aspect of community life.
3. Integrated-Approach Dimension; emphasizes that the formulation of public policy to become a public policy product that has the supporting power and continues to meet the top-down-approach dimension with the bottom-up-approach, the result of which is the realization of an integrated approach, which in this case creates synergy, partnership and equality between government and civil society in formulating and producing policy products, which ultimately return to the public.

Policy formulation as part of the public policy process is the most crucial stage because the implementation and evaluation of policies are only carried out if the policy formulation stage has been completed, in addition to that, the failure of a policy in achieving its objectives is mostly due to the imperfection of the management of the policy formulation stage and realizing policies regarding environmental pollution management based on the widespread use of B3 waste in residential areas due to one of them being the lack of supervision and education to the community so that many ignore the negative impacts of the use of B3 waste on public health in the short or long term in Buru Regency, Maluku Province.

METHOD

The research method used in this research is qualitative (qualitative research). One of the qualitative approaches used in this research is using the Soft Systems Methodology (SSM) method. The development of the human activity system model is carried out with the stages of exploring unstructured problems, discussing them intensively with related parties and experts, comparing the concept of Systems Thinking with the real world and then working to solve problems together.

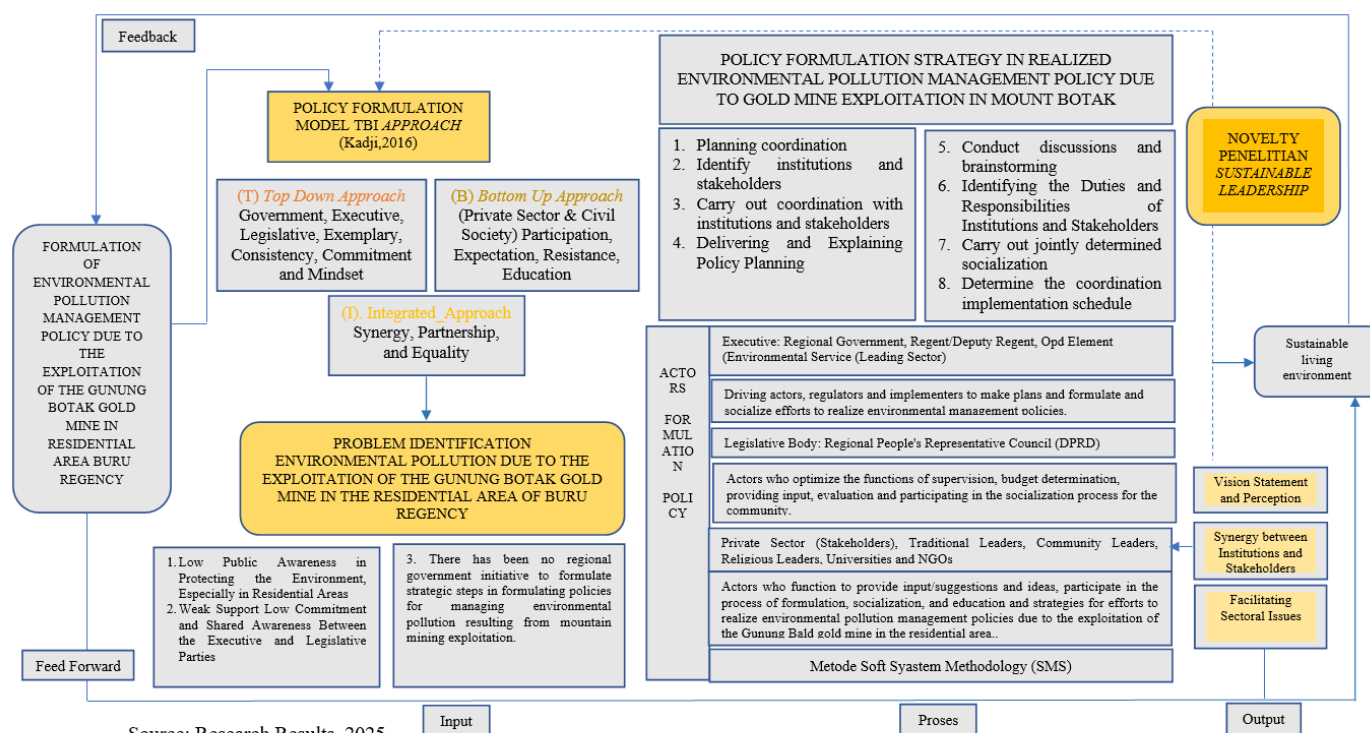
The Soft Systems Methodology (SSM) method itself is a methodology used to handle problems that are unstructured and continuously changing dynamically by using various analytical tools or tools that can be used, so that a balance can be found between elements related to what factors are most dominant in influencing the formulation of environmental management policies due to gold mining exploitation in Buru Regency by conducting a textual analysis approach followed by in-depth interviews with experts. This study also aims to find out who the stakeholders are who play a role in maintaining and preserving the environment in Buru Regency. This study uses data collection methods by conducting: literature studies, in-depth interviews, field observations and data analysis in Soft Systems Methodology (SSM) (Checkland, 2006).

RESULTS AND DISCUSSION

The demand to implement environmental pollution management policies resulting from the exploitation of the Gunung Botak gold mine in the Buru Regency residential area is an important part that needs to be optimized to the maximum. It is important to realize that such challenges are not easy, but must be managed synergistically, consistently, simultaneously, and sustainably. With regional autonomy, it should be able to be managed adequately by examining the root of the problem and then continuing with regulations through the formulation of appropriate policies that do not conflict with the social conditions of the community (Sudiyarti, 2024). Togetherness fosters a sense of belonging for all stakeholders, ultimately evaluating previous achievement targets and allowing for improvements to see the strengthening aspects that must be prioritized and, of course, how to achieve the targets. Therefore, of course, evaluation of policy planning is needed in the coordination process to control organizational performance accountability through measurements based on changes in institutional-based performance, leadership based on knowledge and accountability of various policy actors to aim for the following things: unifying visions and perceptions, synergy between institutions and facilitating sectoral issues (Ogola, 2024).

The activity of formulating environmental pollution management policies due to gold mining exploitation in the residential area of Buru Regency requires the involvement of several actors, because each has different functions. The local government (executive) in terms of the character of power has the ability to formulate environmental pollution management policies due to the exploitation of the Gunung Botak gold mine, the Regional People's Representative Council (DPRD) concerning the character of power, the DPRD has the ability to create coordination, synergy and synchronization in resolving problems in a participatory manner and involving all interested parties and the private sector related to the character of power. So the community has the ability to strengthen cooperation programs with the local government in supporting the formulation of local government policies to protect and preserve the environment in Buru Regency.

The increased coordination that is formed is generally driven by a mixture of self-interest motives with the desire for the common good and is motivated by the urge to address various increasingly complex social problems that cannot be resolved by each institution or between the government and one other sector related to the management of environmental pollution due to the exploitation of the Gunung Botak gold mine. Maximizing the implementation of coordination is expected to be an effective effort to further maximize all stakeholder actors to align perceptions regarding the importance of maintaining a sustainable environment (Zam Zam, 2020). In the future, the Environmental Service is expected to intensify coordination with stakeholders through increased coordination to be able to plan in detail and carry out its duties and functions optimally. Based on the above explanation, the recommended model for formulating policies for managing environmental pollution due to the exploitation of the Gunung Botak Gold Mine in residential areas in Buru Regency, Maluku Province is as follows:



Picture 1
Recommendations for an Effective Policy Formulation Model for Environmental Pollution Management Due to the Exploitation of the Gunung Botak Gold Mine in the Residential Area of Buru Regency

Based on the figure above, the initial process for formulating a policy for managing environmental pollution resulting from the future exploitation of the Gunung Botak gold mine is crucial. This initial process needs to be carefully considered to ensure that planning and implementation are not merely patchwork but have a clear direction and purpose. Therefore, within this framework, it is clear that strengthening the dimensions of efforts to formulate a policy for managing environmental pollution resulting from the exploitation of the Gunung Botak gold mine among policy-making actors needs to be comprehensively designed in Buru Regency.

Policy formulation is the development of alternative policies to address issues that have entered the public agenda (Sacco, 2018). To understand the policy formulation process, the first step is to understand the actors involved in the policy formulation process, both official and unofficial. To understand who actually formulates the policy, it is necessary to first understand the characteristics of all actors and participants, what parts or roles they play, the authority or form of power they possess, and how they relate to and monitor each other (Papazoglou, 2021). As part of the policymaking process, as previously mentioned, it is a complex process (Popović, 2014). Because of this complexity, models or approaches to policy formulation are essential. These models are crucial for studying the policy formulation process and are better understood as an effort to simplify reality and can serve as guidelines for public policy observers in determining and proposing relationships between concepts used to observe environmental pollution symptoms (Richardson, 2021).

The researcher's attitude in this study is related to Kadji's theory (2016) regarding the policy formulation model which includes the TBI Approach dimensions (Top Down, Bottom Up and Integrity Approach) in realizing environmental pollution management policies due to the exploitation of the Gunung Botak gold mine in Buru Regency which are still quite actual and relevant, however, there are still some weaknesses in its implementation. To anticipate the weaknesses of Kadji's theory in an effort to realize environmental pollution management policies due to the exploitation of the Gunung Botak gold mine, the researcher found novelty as an element of strengthening the TBI Approach dimension of policy formulation from Kadji's theory to realize effective environmental pollution management policies due to the exploitation of the Gunung Botak gold mine in Buru Regency, namely Sustainable Leadership.

Strengthening leadership is crucial in formulating environmental pollution management policies resulting from the exploitation of the Gunung Bald gold mine in Buru Regency. The Environmental Agency, as the leading sector, must implement the planning phase in stages. The implementation phase itself depends on the planning processes, which logically require one activity to be implemented before another and substantially depend on the vision to be achieved. This phase generates priorities that, once elaborated, can become a strategy for implementing the plan through:

a. Short-Term Plan

1. Closing illegal mines
2. Cessation of the use of mercury in gold management in the organization's area
3. Provision of temporary waste storage tanks
4. Public education on the dangers of mining waste
5. Technical training on mercury-free gold management
6. Formation of an Emergency Task Force (DLH, Regional Government, TNI/Polri)
7. Involvement of the community, traditional leaders, and religious leaders

b. Medium-Term Plan

1. Initial environmental rehabilitation by filling holes left behind by gold processing in residential areas
2. Reclamation of former gold processing waste areas with local vegetation
3. Strengthening regulations and law enforcement
4. Regular monitoring
5. Empowerment of alternative economies through career transition programs for artisanal miners
6. Establishment of green cooperatives based on agriculture or crafts
7. Environmental education by integrating local education curricula with environmental conservation materials

c. Long-Term Plan

1. Ecosystem restoration, sustainable technology, and post-mining area transformation, namely the repair of watersheds contaminated with heavy metals.
2. Restoration of damaged protected forest areas.
3. Green mining technology requires companies to use zero-waste mining technology and a mine wastewater recycling system.
4. Sustainable governance: establishing a monitoring system (NGOs, the private sector, communities, and academics) within a sustainable mining management forum.
5. Community independence: enabling communities to actively and independently protect the environment, fostering a culture of environmental awareness across generations.

Amidst technological advancements and global economic growth, humanity is now faced with serious threats to the environment. Climate change, pollution, the water crisis, and the loss of biodiversity are no longer future issues but realities we face today. Therefore, the action plan for formulating environmental pollution management policies resulting from the exploitation of the Gunung Bald gold mine in Buru Regency in the future can be directed at:

1. Establishing no-mining zones, establishing conservation areas and settlements free from mining activities, with a strategy for enforcing laws and regulations on illegal mining.
2. Prohibiting the use of mercury and cyanide, accompanied by strict supervision and legal action, through strengthened cross-sectoral coordination and participatory oversight.
3. Environmental rehabilitation, land restoration, and revegetation are carried out on critical land and damaged river flows.
4. Relocating vulnerable settlements for residents living in high-pollution zones and reorganizing affected settlement areas.
5. Strengthening regional regulations and drafting a regional regulation on the management of the Bald Mountain area.

6. Empowering the community economy as an alternative to mining by developing alternative ecosystems such as MSMEs, organic farming, and locally-based ecotourism.
7. A multi-stakeholder coordination forum involving the Environment Agency (DLH), Energy and Mineral Resources (ESDM), the Department of Housing and Settlements (Disperkim), the Regional Development Planning Agency (Bapedda), the Indonesian National Armed Forces (TNI/Polri), traditional leaders, religious leaders, community leaders, environmental NGOs, and universities.

The success of an organization is very dependent on leadership, especially the Environmental Service (DLH). Effective leadership, strong leadership, and integration are the main keys in leading the organization, especially in efforts to realize the formulation of environmental pollution management policies due to the exploitation of the Gunung Botak gold mine in the organizational area of Buru Regency, Maluku Province.

CONCLUSION

The formulation of environmental pollution management policies due to the exploitation of the Gunung Botak gold mine in the residential area of Buru Regency in the bottom up-approach and integrated-approach dimensions is already optimal, while in the top down-approach dimension it is necessary to strive for technical policies from the local government, legislative support (DPRD) and clarity of coordination and communication of actors in realizing environmental pollution management policies due to the exploitation of the Gunung Botak gold mine in the residential area of Buru Regency. The effective model of environmental pollution management policy formulation due to the exploitation of the Gunung Botak gold mine in the residential area of Buru Regency is through strengthening the top down, bottom up and integrated approach dimensions which are strengthened by leadership components as important elements as well as research novelty in an effort to increase the synergy of all actors in efforts to realize the formulation of environmental pollution management policies due to the exploitation of the Gunung Botak gold mine in the residential area of Buru Regency.

REFERENCES

- Aminah, A., Nurlisa, N., Ubaidullah, U., & Hasan, E. 2022. Aceh Jaya Regency Government Policy in Managing Community Gold Mining. *USK Journal of Sociology (Thought & Application Media)*, 16(2), 215–228
- Astuti, W. F., Agusta, I., & Siwi, M. 2023. The Impact of Unauthorized Gold Mining Activities on the Welfare of Gurandil Households. *Journal of Communication Science and Community Development (JSKPM)*, 1(3), 317–338
- Checkland, Peter B. & Poulter, J. 2006. *Learning for Action: A short definitive account of Soft Systems Methodology and its use for Practitioners, Teachers and Students*, England: John Wiley& Sons Ltd.
- Damar, M. P., Pangemanan, F. N & Waworundeng, W. 2022. Government Functions in Controlling Unlicensed Gold Mining (Crates) in Laine Village, South Manganitu District, Sangihe Islands Regency. *Journal of Governance*, 2(1), 1–12
- Deliza Eryani, N. 2021. Regional Government Policy in the Management of Environmental Damage in Sijunjung and Dharmasraya Regencies. *Journal of Democracy and Local Politics*, 2(1), 1–15
- Erwan Darmawan, Soleh Suryadi and Bambang Heru Purwanto. 2016. Model Formulation In Strengthening Local Culture Resistance In Ciamis District. *The Seybold Report*, 18 (06), 2106-2112
- Fermana, R, et al. 2020. The Impact of Small-Scale Gold Mining on the Sustainability of Coastal Ecosystems and Socio-Economics in Pelangan Village, West Lombok. *Scientific Journal of Science and Technology*, 3(2), 1-15
- Firdaus & Simangunsong, S. 2022. Environmental Impact Assessment of Gold Mining Activities in Beutong

District, Nagan Raya Regency. *Journal of Science and Technology*, 16(02), 128–135

Kurnia, I. 2024. Regional Control over Mining in the Perspective of Regional Autonomy (Analysis of Potential Conflict Management of the Rakyatpoboya Gold Mine in Palu). *International Journal of Social and Local Economic Governance (IJLEG)*, 1(1), 61–72

Muhammad Yunus, Fitriani, Vinsenco R. Serano, Albertus, Y. Maturan and Hasniati Hamzah. 2022. Public Policy Formulation Model Based on Local Interest in Border Areas. *International Journal of Civil Engineering and Technology*, 1 (4), 11-22

Muslihudin, M., Rosyadi, S., & Santoso, J. 2020. Sustainable Traditional Gold-Mining Management in Banyumas, Central Java, Indonesia. *International Journal of Conservation Science*, 10(1), 139-148

Ogola, J.S., Winnie, V., Mitullah, W.V., Omulo, M.A. 2021. Impact of Gold Mining on The Environment and Human Health: A Case Study in the Migori Gold Belt, Kenya, *Environmental Geochemistry and Health*, 2(4), 141-157

Papazoglou, Grammatiki. 2021. Society and Culture: Cultural Policies Driven by Local Authorities as A Factor in Local Development—The Example of the Municipality of Xanthi-Greece. *Heritage* 2(3), 2625-2639

Popović, V., Miljković, J.C, Subić, J., Jean-Vasile, A., Adrian, N., Nicolăescu, E. 2015. Sustainable. Land Management in Mining Areas in Serbia and Romania, *Sustainability*, 7(2), 11857-11877

Richardson, G.P. 2021. System Dynamics: Simulation for Policy Analysis From a Feedback Perspective. In P.A. Fishwick (Ed.). *Qualitative simulation modeling and analysis*. New York: Springer-Verlag.

Roberto Adriano Lombah, et al. 2021. Gunung Mas Regency Government Policy in Controlling Environmental Damage from Small-Scale Gold Mining (Case Study of Tanjung Riu Village, Kurun District, Gunung Mas Regency, Central Kalimantan Province). *UPR: Kaharati*, 1(2), 93–107

Sacco, Pier Luigi, Blessi, Giorgio Tavano and Nuccio, Massimiliano. 2018. Cultural Policies and Local Planning Strategies: What Is the Role of Culture in Local Sustainable Development. *The Journal of Arts Management, Law, and Society*, 3(1), 45-59

Sudiyarti, N., Fitriani, Y., & Jusparnawati, J. 2024. Analysis of the Socio Economic Impact of the People's Gold Mine on the Lito Village Community. *Journal of Economics & Business*, 9(2), 152–160

Zam Zam, Z., & Putrawan, I. M. 2020. Evaluation of Mining Environmental Management Policy on Obi Island, North Maluku Province. *Scientific Journal of Environmental Education and Development*, 21(02), 58–69