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MORALITY BEFORE KNOWLEDGE

Local–wisdom–based risk communication as a transformative strategy for sustainability transitions in resource-extractive industries

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ABSTRACT

Background: Effective communication strategies in the mining industry are fundamentally essential. Environmental degradation, health risks, and social conflicts faced by mining companies and surrounding communities often lead to various issues that may even disrupt or halt operations. Risk Communication processes grounded in local wisdom play a crucial role, as they influence the sustainability of mining activities and, in the long term, the company's efforts to build meaningful Community Engagement with nearby communities. This study aims to analyze the Local-Wisdom-Based Risk Communication strategies implemented by PT MRC, a mining company preparing to commence operations in Central Kalimantan Province. **Methods:** The research employs a descriptive qualitative method, with data collected through observation, interviews, and document analysis. The analytical framework incorporates several models: Peter Sandman's Risk Communication Strategy Model, the IAP2 Public Participation Spectrum, and the International Risk Governance Center (IRGC) Risk Governance Framework. **Findings:** The findings indicate that PT MRC adapts its Risk Communication strategies according to the levels of hazard and outrage associated with each risk: employing outrage management for land conflict issues, crisis communication for declining community welfare, and precautionary advocacy for environmental pollution and health-related risks. Following the IRGC model, PT MRC's Risk Communication governance integrates four key elements—pre-assessment, appraisal, characterization and evaluation, and management—implemented through cross-sectoral coordination. **Conclusion:** The study finds that Local-Wisdom-Based Risk Communication serves as a cross-cutting element that informs other components of the model. Incorporating local wisdom within the Risk Communication framework has enabled the company to progress in its Community Engagement efforts from the "Inform" level to the "Consult" level. **Novelty/Originality of this article:** Consequently, this study underscores the importance of integrating local wisdom into corporate Risk Communication strategies. This integration could contribute to long-term sustainability transitions and conflict-sensitive development. This integration could contribute to long-term sustainability transitions and conflict-sensitive development

Keywords: crisis communication; community engagement; local wisdom; outrage management; precautionary advocacy; risk communication.

1. Introduction

Community resistance to the presence of mining companies in Indonesia occurs frequently. In his book, Chaplin (2006) defines resistance as actions opposing something, or as social opposition or negativism expressed in response to commands, regulations,

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political policies, and so forth. More simply, resistance may be understood as acts of opposition—either covert or overt—against policies issued by a particular actor.

A comprehensive academic review of more than 200 articles, books, and reports conducted by Conde (2017) explains why and how communities reject mining activities, as well as how their modes of resistance evolve over time. The review reveals that local communities do not merely react to perceived environmental impacts but also to the lack of representation and participation in decisions regarding development trajectories, insufficient compensation, and distrust toward mining companies and the state. Communities are concerned about the risks posed by mining operations, and these concerns in turn become risks for the companies themselves (Suopajärvi et al., 2023).

Several cases in Indonesia highlight community resistance to perceived risks associated with the presence of mining companies. One example is the opposition by residents of Sumberagung Village against the establishment of a gold mining company in the Mount Tumpangpitu area, Banyuwangi Regency. The resistance escalated into riots that resulted in civilian casualties (Ningtyas, 2015). Subsequent investigation revealed that the resistance stemmed from community suspicion that mining activities had contaminated local water sources (Roddini, 2017).

Another case occurred in Sangasanga Village, Kutai Kartanegara Regency, East Kalimantan Province. Communities experienced negative impacts from a coal mining company operating from 2002 to 2014. The company failed to carry out land reclamation at the end of the mining period, resulting in environmental degradation and uninhabitable conditions due to flash floods and health problems among residents (Asfianur et al., 2020). This created a sense of trauma among the local population and subsequently led to strong rejection of new mining companies seeking to operate in the area.

Risk is defined as the probability of undesirable events or outcomes (Aristyavani, 2022). The International Risk Governance Council (IRGC, 2017) further states that risk always involves two components: the likelihood of potential consequences and the severity of those consequences arising from human activities, natural events, or a combination of both. Haddaway et al. (2022) emphasize that mining activities—including prospecting, exploration, construction, operation, maintenance, expansion, closure, decommissioning, and post-mining land use—can affect social systems and the environment. Communities living near mining operations frequently face risks such as significant ecological degradation (Vatalis & Kaliampakos, 2007), disruption of land and water use (Sonter et al., 2014), and increased incidence of cancer and heavy-metal-related diseases (Fernández-Navarro et al., 2017).

Palenchar & Heath (2007) argue that risks that are not proactively managed expose both community members and industrial workers to hazards associated with living and working near industrial facilities. When this happens, activist protests are likely to intensify, and the credibility of the risk-generating organization will be increasingly questioned. Therefore, to reduce the likelihood of mining-related risks that adversely affect surrounding communities, mining companies must develop appropriate risk communication strategies (Sapar & Syafruddin, 2021). When risks are not properly communicated to local communities, the consequences may be twofold: threats to community safety and disruption of mining operations. As key stakeholders, local communities may resist companies they perceive as hazardous to their well-being (Adnan & Somantri, 2022).

Studies conducted by Palenchar & Heath (2007) conceptualize Risk Communication as a tool for conveying corporate values and identity. They describe Risk Communication as a mechanism for minimizing potential risks by informing stakeholders about the risks posed by company operations, with the ultimate goal of enhancing understanding so that stakeholders can act to mitigate risk impacts. Importantly, they argue that communication processes yield not only informed understanding but also strengthened social relationships. Thus, Risk Communication becomes a means of communicating values, identity, awareness, attitudes, and behaviors related to risk.

Mining industries in Indonesia often operate in rural areas. Industrial presence in such regions is considered part of broader development efforts aimed at promoting rural

economic growth and ensuring equitable development distribution. As an agrarian nation, Indonesia has sought to accelerate industrial growth over recent decades. Industrial development is viewed as capable of reducing excessive urbanization, increasing rural income, diversifying employment opportunities, and stimulating regional development (Al Siddiq et al., 2019). This condition brings modern industrialization into direct contact with traditional local wisdom. Consequently, incorporating local wisdom into Risk Communication is expected to enhance the effectiveness of information exchange and mutual understanding regarding mining-related risks, enabling communities to undertake appropriate preventive actions.

In a study on cultural diversity published by the Ministry of Education and Culture (Kemendikbud, 2016), local wisdom is defined as values or behaviors through which local communities interact wisely with their environment. In the Indonesian cultural system, local wisdom is expressed through ethnic, religious, and linguistic diversity. The study found that 96.1% of villages exhibited strong traditions of mutual cooperation (*gotong royong*). This indicates that communal solidarity is deeply embedded in Indonesian rural life.

Moreover, local communities demonstrate high levels of tolerance and social concern, such as acceptance of activities conducted by people of different ethnic or religious backgrounds, as well as traditions of environmental stewardship, particularly in protecting water resources. Therefore, within Indonesia's cultural diversity lie values such as mutual cooperation, tolerance, and social responsibility—values that can be integrated into models of Local-Wisdom-Based Risk Communication. Local-Wisdom-Based Risk Communication is crucial because, when successful, it enhances community understanding of risks and supports preventive action. Conversely, failure to communicate risks effectively results in poor public understanding and an inability to prevent or avoid harm (Mikulecký et al., 2023).

Risk Communication from a cultural perspective is further elaborated by Tansey & Risk (2008), who argue that risk perceptions are shaped by the social groups individuals belong to—organizations, peer groups, or other sources of authority. Thus, attitudes and judgments about risk and social justice are culturally embedded within collective expectations and value systems. Djufri et al. (2022) classify local wisdom into several forms: (1) locally developed norms; (2) community rituals and traditions; (3) folk songs, myths, legends, and stories; (4) knowledge from community elders and spiritual leaders; (5) ancient manuscripts; (6) daily livelihood practices; (7) tools and materials used for specific needs; (8) natural environmental conditions; and (9) language.

In mining contexts—where companies pose environmental and social risks yet also contribute to regional economic growth, infrastructure development, employment creation, and technological transfer (Fitriyanti, 2016)—the daily livelihood practices of local communities become a critical aspect of local wisdom. Mining activities often threaten traditional livelihoods such as fishing, hunting, and forest-product gathering. Effective Risk Communication in mining also influences public trust. Jardine et al. (2013) found that social and individual trust in decision-makers plays a major role in the effectiveness of consultations on environmental and health risks, as well as acceptance of risk-related decisions. Trust in risk managers is essential for developing appropriate and socially acceptable risk management options.

Cuppen & Pesch (2021) argue that research on social acceptance must examine (1) social conflicts as multi-actor processes, (2) conflicts as participatory processes, and (3) interactions among multiple overlapping conflicts. Thus, well-designed Risk Communication strategies can support the development of Community Engagement, meaning increased public participation in managing risks arising from company operations. Greater public participation enhances community capacity to understand and anticipate risks.

The connection between Risk Communication and Community Engagement has been widely discussed during the COVID-19 pandemic. In December 2020, the World Health Organization (WHO) issued guidance for Risk Communication and Community Engagement

(RCCE) in responding to COVID-19. Researchers in various countries adapted the *Regional Guiding Framework for RCCE in the Eastern Mediterranean Region/Middle East and North Africa* to their respective national contexts.

The core concept of RCCE centers on involving communities in communicating risks associated with the virus. Community involvement fosters trust in public health interventions (Maganga et al., 2023). Effective risk communication in public health emergencies requires proactively communicating what is known, what remains unknown, and what is being done to learn more, with the goal of saving lives and minimizing adverse consequences (World Health Organization, 2020).

Furthermore, the integration of the IRGC model and local wisdom should be viewed as a foundational element of sustainability communication. While traditional risk communication often focuses on immediate technical hazards, sustainability communication emphasizes long-term dialogue aimed at socio-environmental viability (Godemann & Michelsen, 2011). In the context of extractive industries, this approach is inherently linked to conflict-sensitive development. By incorporating local values into the risk governance framework, companies can ensure that their communication strategies do not exacerbate existing social tensions, but rather contribute to a resilient sustainability system that acknowledges the rights and perspectives of local communities.

One Indonesian coal mining company that has implemented such an approach is PT Murung Raya Coal (PT MRC), operating in Murung Raya Regency, Central Kalimantan. As part of its commitment to Good Corporate Governance (GCG)—ensuring that the company not only focuses on business operations but also supports environmental sustainability and local communities—PT MRC completed its Community Development and Empowerment Master Plan (RI-PPM) in 2022, as required by government regulations. The RI-PPM document, prepared alongside feasibility and environmental studies, includes the results of social mapping conducted prior to mining operations. The social mapping identifies community potentials, challenges, and needs within PT MRC's operational area, forming the basis for identifying community risks associated with mining activities.

Table 1. SWOT analysis of PT MRC's risk communication activities

No.	Strengths	Weaknesses	Opportunities	Threats
1	Can identify the main types of risks faced by companies and communities in mining operations areas	Increases the time required before mining operations can be carried out	It can be an example for similar companies that also operate in areas around the mine, and can reduce the potential for conflicts that will incur large costs.	Rejection or resistance from the community due to their past experiences with other companies that are considered to have harmed the community.
2	Can be a solution to the problem of broken communication between companies and the community	Increase the company's operational costs	Can open up information regarding new resources around the mining area	The location is quite difficult for the Operational Team to reach so that the implementation of activities can be hampered or fail.
3	Comply with regulatory rules related to RI-PPM	Success is very dependent on the Operational Team, in this case Consultants and Community Support Staff	Can be the basis for consideration by the Ministry of Energy and Mineral Resources in giving awards to mining companies.	Resistance or rejection from other companies or certain members of society who have certain interests

These risks relate to natural resources, human resources, financial resources, physical/infrastructural resources, and social resources. For example, in Olung Balu

Village—the closest settlement to the mining site—environmental issues include frequent flooding due to proximity to the river. Other findings include limited community skills, high unemployment, economic dependence on rubber tapping, underutilized water resources, remote market access, and inadequate healthcare facilities. The SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis of PT MRC's Local-Wisdom-Based Risk Communication activities in its mining operational area is mention in Table 1.

The situation and conditions faced by PT Murung Raya Coal and the surrounding communities, as reflected in the SWOT analysis above, present an intriguing context for examining how risk communication is employed to build community engagement—particularly by a mining company that is only beginning its operations in a rural area inhabited by local communities with distinct cultural wisdom. On the other hand, PT Murung Raya Coal, as a mining company at the early stage of its operational lifecycle, is also compelling as a research subject due to its classification as a small–medium enterprise that has not yet evolved into a large-scale mining corporation. Since risk communication activities—embedded within community development or corporate social responsibility (CSR) programs—are inherently linked to budgetary constraints, the ability to implement effective and efficient risk communication becomes a critical focus for the company. This study, seeks to analyze the local-wisdom-based risk communication strategies employed by a mining company in its efforts to foster meaningful community engagement.

The objectives of this research are twofold; (1) to analyze PT MRC's local-wisdom-based risk communication strategies, and (2) to examine how culturally grounded communication contributes to building community engagement. The findings provide both theoretical contributions—to the literature on risk communication and stakeholder engagement—and practical implications, by offering an adaptable framework for mining companies operating in environments rich in local wisdom, particularly within the cultural context of the Dayak communities in Central Kalimantan.

This study contributes new insights to the scholarship on risk communication in the mining sector by demonstrating that local wisdom is not merely a cultural complement but can function as a strategic, cross-cutting mechanism within the broader risk governance framework. By integrating Sandman's hazard–outrage model, the IRGC risk governance framework, the IAP2 public participation spectrum, and the local knowledge systems of the Dayak community, the study presents a new analytical perspective showing how local values, norms, and cultural practices can reinforce each stage of risk communication—from pre-assessment, risk appraisal, and characterization & evaluation, to risk management—within the mining context of rural Indonesia.

Empirically, the study also demonstrates that local-wisdom-based risk communication strategies can elevate community engagement from the "Inform" level to the "Consult" level, even for small–medium mining companies in the early stage of operation. Thus, this research fills an important gap in the literature by offering a culturally adaptive and responsive model of risk communication for mining companies operating in Indigenous community settings, particularly within the socioecological environment of the Dayak communities of Central Kalimantan. Furthermore, it addresses the scarcity of empirical studies exploring how localized, culture-based risk governance—leveraging the IRGC framework—serves as a necessary precursor for a broader sustainability system and transition in the industry.

2. Methods

This study employs a case study method, as described by Yin (2018), which constitutes an empirical approach used to investigate contemporary phenomena in depth and within their real-world context, particularly when the boundaries between the phenomenon and its context are not clearly delineated. This method is appropriate for providing a comprehensive explanation of the Local-Wisdom-Based Risk Communication Plan within the community engagement management practices implemented by PT MRC. The overall research flow is mention on Figure 1 below.

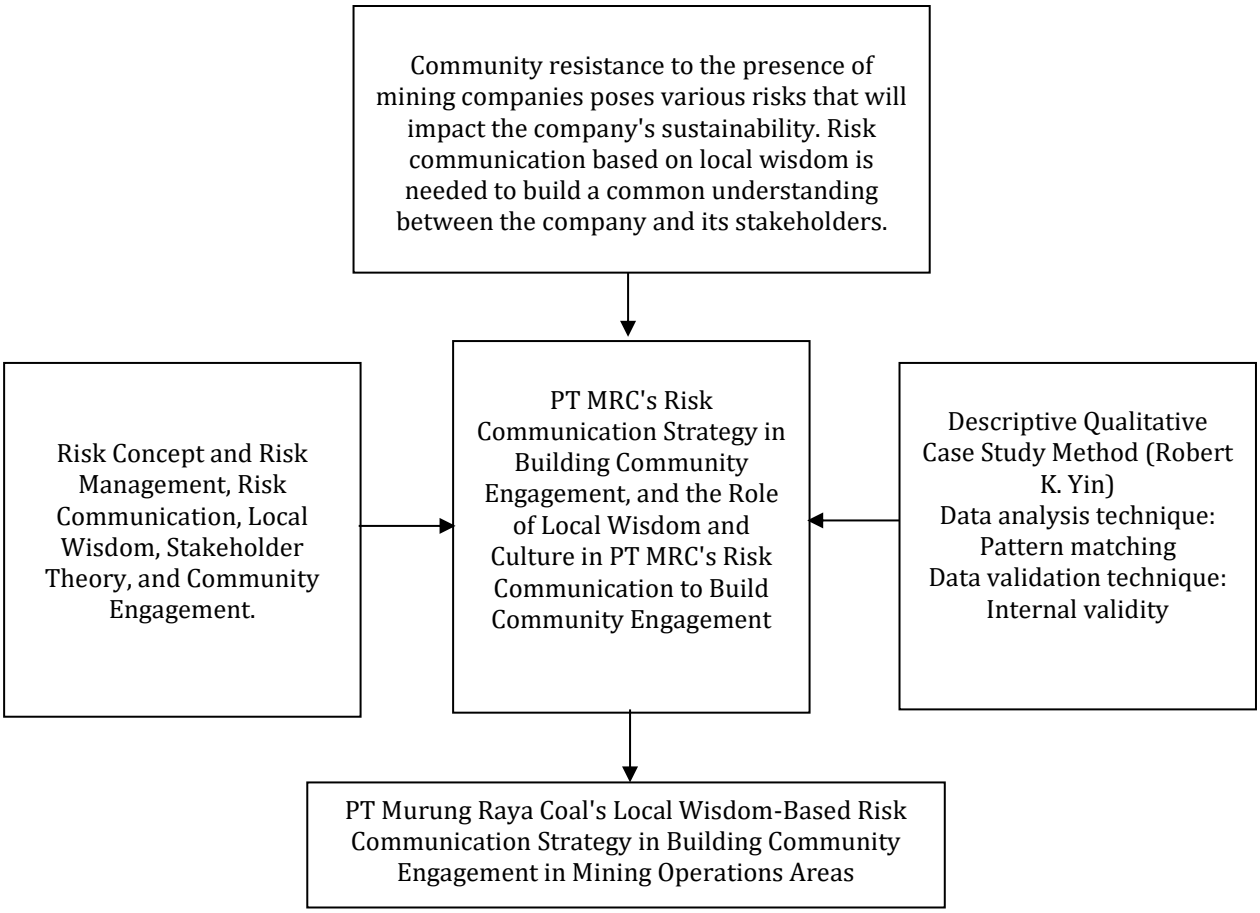

Fig. 1. Research flow

The type of case study employed is a descriptive case study, which aims to understand the interaction between PT MRC's risk communication practices and the local cultural traditions present in the mining area. Data collection methods include in-depth interviews with company officials, local leaders, and community members; participant observation during company–community interactions; and analysis of internal documents, including the Social Mapping Report and the Community Development Master Plan (RI-PPM).

This study draws upon Sandman's (1993) Risk Communication model, which differentiates strategies based on levels of hazard and outrage, as well as the International Risk Governance Council (IRGC, 2017) framework emphasizing pre-assessment, assessment, characterization, evaluation, and management. Levels of community engagement are analysed using the IAP2 Public Participation Spectrum, which categorizes participation into Inform, Consult, Involve, Collaborate, and Empower. The novelty of this research lies in the integration of these models within a culturally specific context, resulting in a unique conceptual approach within the communication and mining literature.

Data were analysed using thematic analysis, supported by NVivo qualitative analysis software. Themes were identified around communication design, stakeholder engagement, and contextual adaptation. Data validity was ensured through triangulation across interviews, observations, and document analysis. To ensure analytical rigor, the identification and operationalization of local wisdom were carried out through a systematic three-stage process using NVivo. In the first stage, local wisdom was identified through a combination of field observations and semi-structured interviews. The data obtained were analyzed using in vivo coding to capture the specific cultural terminologies employed by Dayak communities. In the second stage, the initial codes were organized into broader thematic categories based on their functional roles in social governance, allowing them to be recognized as cross-cutting elements within risk communication processes. Finally, in

the third stage, these elements were operationalized by mapping them directly onto the IRGC framework, enabling a structured and contextually grounded analysis.

3. Results and Discussion

The object of this study is the Local-Wisdom-Based Risk Communication strategy of PT MRC in building community engagement, as well as the role of local knowledge and culture in shaping PT MRC's risk communication strategy. Accordingly, the subjects of this research are the stakeholders involved in the Social Mapping activities conducted for the development of the company's Community Development and Empowerment Master Plan (RI-PPM), within which PT MRC's risk communication activities are embedded.

PT MRC is a coal mining company operating in Tanah Siang and Laung Tuhup sub-districts within Murung Raya Regency, Central Kalimantan Province. Based on the Decree of the Regent of Murung Raya No. 188.45/188/2012 dated 30 May 2012, the company holds a Production Operation Mining Permit (IUP-OP) valid until 30 May 2032, and it initiated its production operations in 2023. The company's concession area covers approximately 14,870 hectares. The directly affected areas of PT MRC's operations are located in Murung Raya Regency, specifically within the sub-districts of Tanah Siang and Laung Tuhup. Meanwhile, the indirectly affected areas include Saripoi Village (Tanah Siang) and Muara Laung I Village (Laung Tuhup). List of villages in the operational area of PT Murung Raya Coal can be read in Table 2 below.

Table 2. Villages in the operational area

No	Village/Sub-district	Subdistrict	Status
1.	Olung Balo	Tanah Siang	Ring I
2.	Tokung	Tanah Siang	Ring I
3.	Kalang Duhung	Laung Tuhup	Ring I
4	Beralang	Laung Tuhup	Ring I
5	Tumbang Tonduk	Laung Tuhup	Ring I
6	Saripoi	Tanah Siang	Ring II
7	Muara Laung I	Laung Tuhup	Ring II

To achieve the objectives of this study, several participants and informants were interviewed to obtain the necessary data. Individuals involved in PT MRC's risk communication activities and serving as interview sources included company leaders and employees, consultants supporting the Social Mapping process, relevant government officials within PT MRC's operational area, and members of the local community. The findings reveal four primary types of risks present within PT MRC's mining operation area: (1) declining community welfare, (2) land-related conflicts, (3) environmental pollution, and (4) health disturbances. The conditions associated with each risk category are as follows:

3.1 Risk of declining community welfare

The hazard level associated with declining welfare is considerably high, as indicated by PT MRC's Social Mapping results showing that local communities possess minimal livelihood assets yet remain resilient. Simultaneously, community outrage is also high. This heightened outrage stems from concerns over employment issues, which the community perceives as the top priority requiring resolution. Residents urgently need income-generating opportunities to compensate for reduced or lost access to forest resources and water sources due to mining operations. With both hazard and outrage at high levels, the appropriate communication strategy—following Sandman's model—is Crisis Communication. This strategy emphasizes avoiding premature certainty, sharing dilemmas, demonstrating empathy, offering actionable steps, and acknowledging uncertainty.

The study finds that PT MRC's messaging primarily focuses on; (1) the company's presence in the area, (2) the potential positive and negative impacts of mining operations, and (3) the corresponding risk mitigation measures. The researcher assesses that this approach aligns with Crisis Communication principles, as discussing negative impacts alongside mitigation efforts reflects empathy, shared dilemmas, and avoidance of overconfidence. A key recommended improvement is for PT MRC to adopt a more explicit and empathetic communication approach by openly acknowledging that welfare-related employment issues constitute significant challenges for the community. In doing so, the company should clearly convey its commitment to not leaving residents to להתמודד these difficulties on their own. This acknowledgment, combined with a demonstrated willingness to collaborate on solutions, can strengthen trust, enhance credibility, and foster a more inclusive and responsive risk communication process.

3.2 Risk of land-related conflicts

The hazard level associated with land conflict is low, as PT MRC has not yet begun operations and has not encountered any disputes with local communities regarding land encroachment or related issues. However, the outrage level is high due to numerous precedents of land conflicts between mining companies and communities in Murung Raya Regency. Recent demonstrations have resulted in several individuals being detained by authorities, heightening community anxiety. With low hazard but high outrage, the appropriate strategy is Outrage Management, which focuses on reducing community anger by listening, acknowledging concerns, apologizing when necessary, and building trust.

In this study, PT MRC's messaging—centered on (1) its presence, (2) potential positive and negative impacts, and (3) risk mitigation efforts—was delivered through interactive Social Mapping activities, which included listening to community perceptions. The researcher therefore concludes that elements of Outrage Management have been applied. A further recommended improvement is for PT MRC to emphasize, through its communication efforts, that the risks of land conflict can be minimized when both the company and the community engage in continuous and open dialogue. By reinforcing the idea of shared responsibility and mutual cooperation, PT MRC can encourage proactive communication, reduce misunderstandings, and create a more collaborative environment for addressing potential conflicts. This approach would not only mitigate risks but also strengthen long-term relationships and trust between the company and local stakeholders.

3.3 Risk of environmental pollution

The hazard level for environmental pollution is high, given the presence of multiple mining companies already operating in the vicinity. However, community outrage is relatively low because residents feel capable of coping with such risks or perceive environmental disasters (e.g., flooding) as part of God's will. Thus, with high hazard but low outrage, the appropriate communication strategy is Precautionary Advocacy, which aims to make communities aware that proactive measures are required to avoid potential harm. PT MRC's current messaging—concerning (1) the company's presence, (2) possible impacts, and (3) mitigation measures—has been assessed as consistent with this strategy. The company has informed residents about the technical and social engineering measures planned to address environmental pollution. A further recommended improvement is for PT MRC to develop more salient and visually engaging communication messages regarding environmental pollution risks, ensuring that community members clearly understand the potential dangers they may face. By utilizing stronger visual elements, simplified messaging, and contextually relevant examples, the company can enhance risk perception and awareness among local stakeholders. This approach would make complex environmental information more accessible, encourage more attentive engagement, and ultimately support more informed community responses to potential risks.

3.4 Risk of health disturbances

Health risks in mining operation areas are generally high due to air and water pollution, despite efforts by companies and local government to implement preventive measures. However, community outrage remains low, likely due to residents' familiarity with such conditions. As with environmental pollution, this risk features high hazard but low outrage. Therefore, the appropriate strategy is Precautionary Advocacy, which emphasizes the need for preventive action to avoid adverse health outcomes. In this study, PT MRC has already communicated its planned health-related programs—one of the eight required domains of community self-reliance within the RI-PPM framework—indicating that elements of Precautionary Advocacy are present. A further recommended improvement is for PT MRC to design more prominent and compelling communication messages related to health risks in order to enhance community awareness of potential dangers. By presenting information in a clearer, more engaging, and accessible manner—such as through visual aids, locally relevant examples, and culturally appropriate messaging—the company can improve public understanding of health impacts associated with its operations. This effort would not only strengthen risk perception but also encourage preventive behaviors and more active community participation in health-related risk management.

Given that PT MRC's operations intersect with multiple risk potentials—including land-use conflict, environmental pollution, declining community welfare, and public health concerns—the company has adapted its Risk Communication strategies according to the specific levels of hazard and outrage perceived by the community for each issue. Overall findings reveal those four primary types of risks present within PT MRC's mining operation area: (1) declining community welfare, (2) land-related conflicts, (3) environmental pollution, and (4) health disturbances, are describe in Figure (2) Condition of the Relationship between Hazard and Outrage (Anger) for Types of Risks in the Operational Area of PT MRC Mine, below.

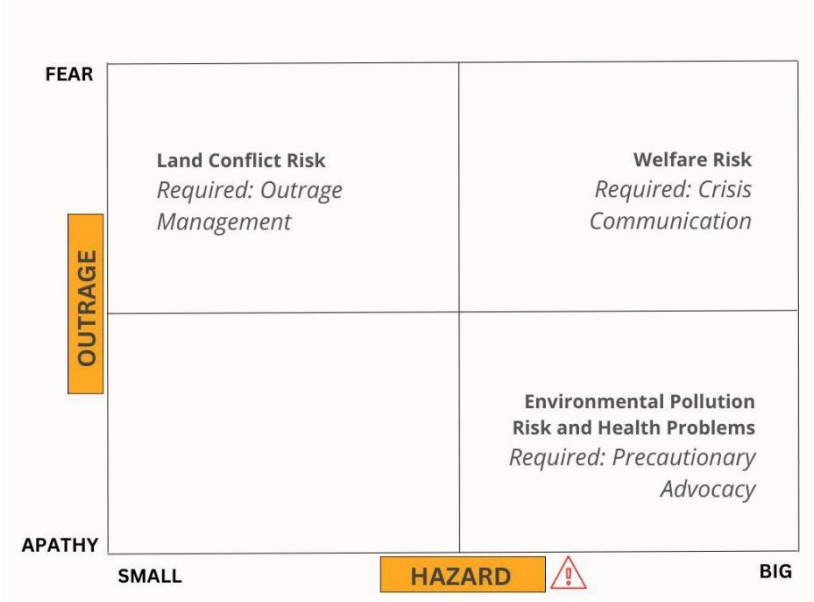

Fig. 2. Condition of the relationship between hazard and outrage (Anger) for types of risks in the operational area of PT MRC mine

PT MRC employs an outrage management strategy to address land-related conflicts, where community outrage is notably high. This approach involves transparent dialogue, community consultations, and participation in traditional *Lapas Lewu* ceremonies, which symbolize reconciliation and cooperation. By demonstrating respect for local customs, the company gains moral legitimacy among community elders, thereby reducing suspicion and hostility. In addressing concerns over declining welfare, PT MRC applies crisis

communication techniques to manage expectations regarding employment opportunities and economic benefits. The company emphasizes shared responsibility, co-designed livelihood programs, and transparent dissemination of economic data. These efforts align with the principles of precautionary advocacy**,** in which communication aims to increase awareness of potential risks while empowering communities to mitigate them (Covello & Sandman, 2001).

Regarding environmental and health risks, PT MRC combines precautionary advocacy with collaborative communication practices by involving local health workers and traditional leaders in jointly conveying risk messages. This integration makes complex technical information more accessible and credible to rural audiences. Such collaborative communication reflects the cultural principle of *gotong royong* (reciprocal cooperation), strengthening trust and shared ownership in environmental management. The study further reveals that PT MRC's engagement practices are consistent with international Risk Communication models while being adapted to the local cultural environment. The model referred to here is the Risk Governance Framework developed by the International Risk Governance Center (IRGC), an independent nonprofit organization based in Switzerland.

To answer the research question regarding the role of local wisdom and culture in PT MRC's Risk Communication strategy for building community engagement, the discussion is directed toward the IRGC Model. Within this model, risk governance is divided into two interrelated components: understanding and deciding. When a risk has been clearly identified and adequately understood, appropriate policy decisions can be formulated based on that understanding.

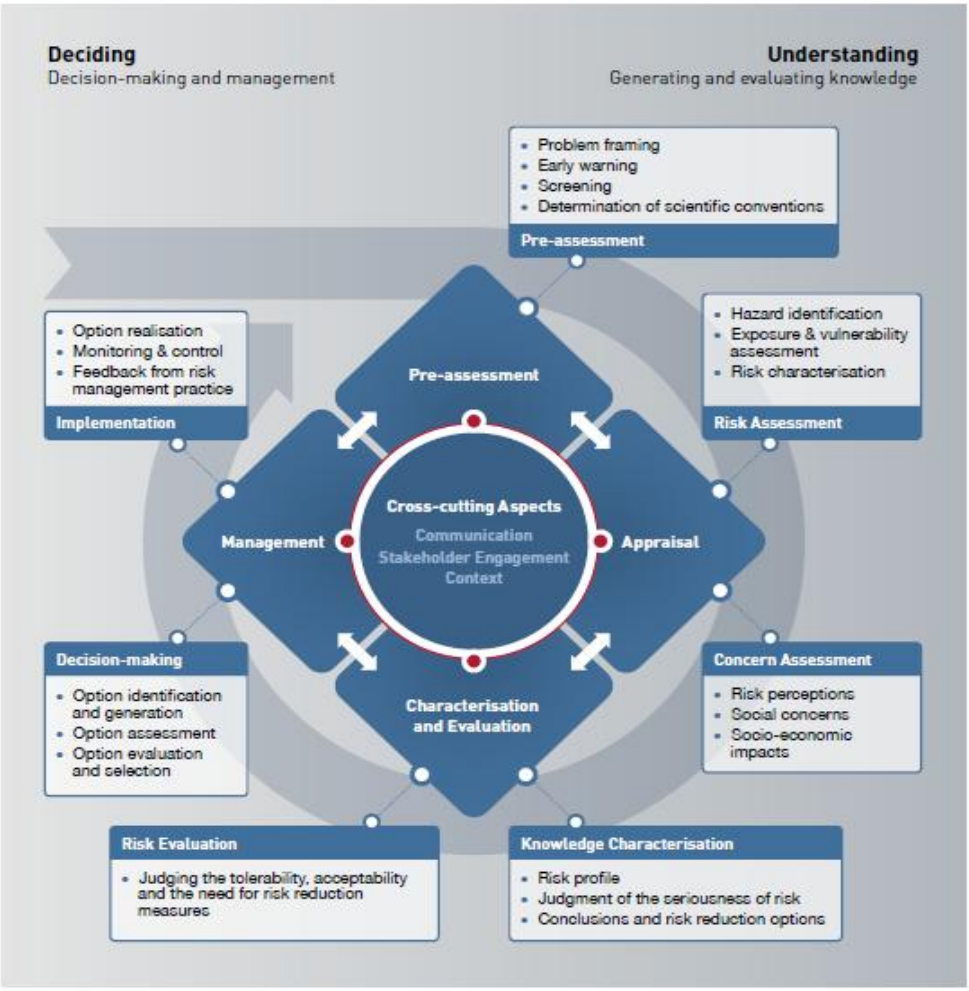

Fig. 3. IRGC risk communication model
(IRGC, 2017)

Risk communication activities conducted by PT MRC can be systematically understood using the IRGC model, which consists of several interconnected stages; pre-assessment, appraisal, characterization and evaluation, management, and risk communication. In the pre-assessment stage, includes risk framing, early warning, and preparatory actions. Findings indicate that PT MRC has conducted systematic risk identification related to mining operations, defined key problems, and determined approaches for managing these risks. Risk framing—particularly the identification of potential risks—is closely tied to elements of local wisdom. In PT MRC's social mapping activities, risk identification was conducted through collective communication forums that align with local cultural norms, where information is exchanged when community members gather. Local wisdom was also reflected in the selection of community figures to serve as communication channels, the involvement of local facilitators who use familiar local languages, and scheduling meetings based on customary community routines, such as weekly returns from the forest. Under the IRGC model, risk framing encompasses not only identifying types of risks (declining community welfare, land-related conflicts, environmental pollution, and health disturbances) but also determining relevant stakeholders (local communities), understanding community risk perceptions (via social mapping), reviewing regulatory frameworks governing such risks (e.g., ministerial decrees related to RI-PPKM), identifying boundaries (program scope, timeline—2023 to 2045—and the company's operational area), and integrating these into a formal risk document (RI-PPKM Document).

The appraisal stage, risk appraisal consists of two components, risk assessment and concern assessment. PT MRC currently conducts risk assessments mainly to identify key risks perceived by communities, as described earlier. However, this stage could be further strengthened by evaluating secondary impacts, risk-control processes, potential scenarios, likelihood and severity assessments, and hazard modelling. The concern assessment has been discussed earlier through the explanation of the Risk Communication Design, which outlines the interaction between hazard and outrage—two fundamental components of risk according to Sandman (1993). Community risk perceptions influence their attitudes and behaviours toward risk-taking. Findings also show that PT MRC integrates local wisdom into concern assessment through mechanisms identified in the pre-assessment phase. This stage can be enhanced by incorporating perspectives from other stakeholders, such as government bodies or investors; assessing stakeholders' responsibility toward risks; identifying cognitive biases; and understanding social amplification or attenuation processes.

In the characterization and evaluation stage, this phase determines the significance of assessed risks to support decision-making. It involves knowledge characterization, a process aimed at reducing the complexity of risks by addressing uncertainties (e.g., insufficient technical data) and ambiguities (e.g., differing research findings). Within PT MRC's Risk Communication framework, this phase begins with social mapping. The outcomes of social mapping provide a foundation for characterization and evaluation, enabling more informed decisions about subsequent actions. This phase requires broader stakeholder involvement, including groups within the community that may have been previously overlooked. Incorporating local wisdom is essential for effective engagement in this context.

In the management stage, this phase includes designing and implementing preventive actions, selecting approaches to mitigate or transfer risks, and maintaining residual risks when necessary. Activities include assessing options, evaluating and selecting appropriate management strategies, and implementing them. PT MRC has implemented a range of risk management strategies that reflect an integrated approach combining technical, social, and communicative dimensions. First, through engineering interventions, the company conducts geotechnical and geological assessments focusing on soil strength, rock stability, and groundwater flow, with the aim of restoring post-mining environments as closely as possible to their original conditions prior to operations.

Second, PT MRC applies social engineering strategies designed to transform community livelihood patterns, particularly by providing training in agriculture and

livestock farming to support more sustainable and independent economic activities. Third, risk communication is carried out to address community perceptions and concerns regarding the company's presence, emphasizing transparency in conveying both the positive and negative impacts of mining activities.

In addition, the company implements social programs aimed at fostering community independence across eight sectors mandated by RI-PPKM, namely education, health, real income and employment, economic independence, sociocultural development, environmental sustainability, community institutional strengthening, and infrastructure development. Collectively, these strategies demonstrate PT MRC's effort to align risk management practices with both environmental restoration goals and community empowerment. As in previous phases, effective implementation requires broad stakeholder engagement, particularly with community groups that have not yet been fully reached. Local-wisdom-based approaches remain crucial for ensuring acceptance and participation.

last risk communication stage, in the IRGC model, Risk Communication serves as a cross-cutting function linking all phases. It involves sharing knowledge, information, and data across diverse groups (experts, regulators, industry, consumers, and the general public). The study identified several key factors that support the effectiveness of PT MRC's risk communication process. First, the presence of dedicated facilitators—comprising consultants and village-based local assistants—plays a crucial role in managing and sustaining communication activities between the company and the community. These actors function as intermediaries who help translate information and maintain engagement at the local level.

Second, PT MRC utilizes multiple communication channels to ensure broader outreach and inclusivity. These include direct meetings with community members, institutional interactions with organizations such as the Dayak Customary Council (DAD) and TBBR, as well as active engagement with religious and customary leaders. This multi-channel approach enables the company to reach diverse stakeholder groups and strengthens the legitimacy of the communication process.

Third, the availability of tools to address uncertainty and misinformation further enhances the communication strategy. These include the assignment of designated field personnel (three persons in charge/PICs), the use of digital communication platforms such as SMS and WhatsApp, structured company response mechanisms, and the development of standard operating procedures (SOPs) along with communication guidelines. Together, these elements contribute to a more responsive, transparent, and adaptive risk communication system.

Within this context, Local-Wisdom-Based Risk Communication has effectively strengthened community engagement by increasing public participation. Previously, communities received predominantly one-way information from the company; however, through PT MRC's social mapping—where Risk Communication is embedded—community perceptions were heard, analyzed, and integrated into company decision-making processes. Thus, PT MRC's Risk Communication, aligned with the IRGC model, has positioned local wisdom as a critical factor influencing success across all phases. Several forms of local wisdom were also recommended by communities for further development as communication approaches, including the culture of *Hahandep* (mutual cooperation), traditional dances such as Memotong Kompong, Lawang Seketeng, Tenturo, Giring-giring, Manasai, Nandan, Deder, and others; Karungut chants; and rituals such as Kekahan and Tekuman. Based on these findings, a PT MRC Risk Communication Model was developed, adapted from the IRGC Risk Governance Model (2017). This model is illustrated in Figure 4 below.

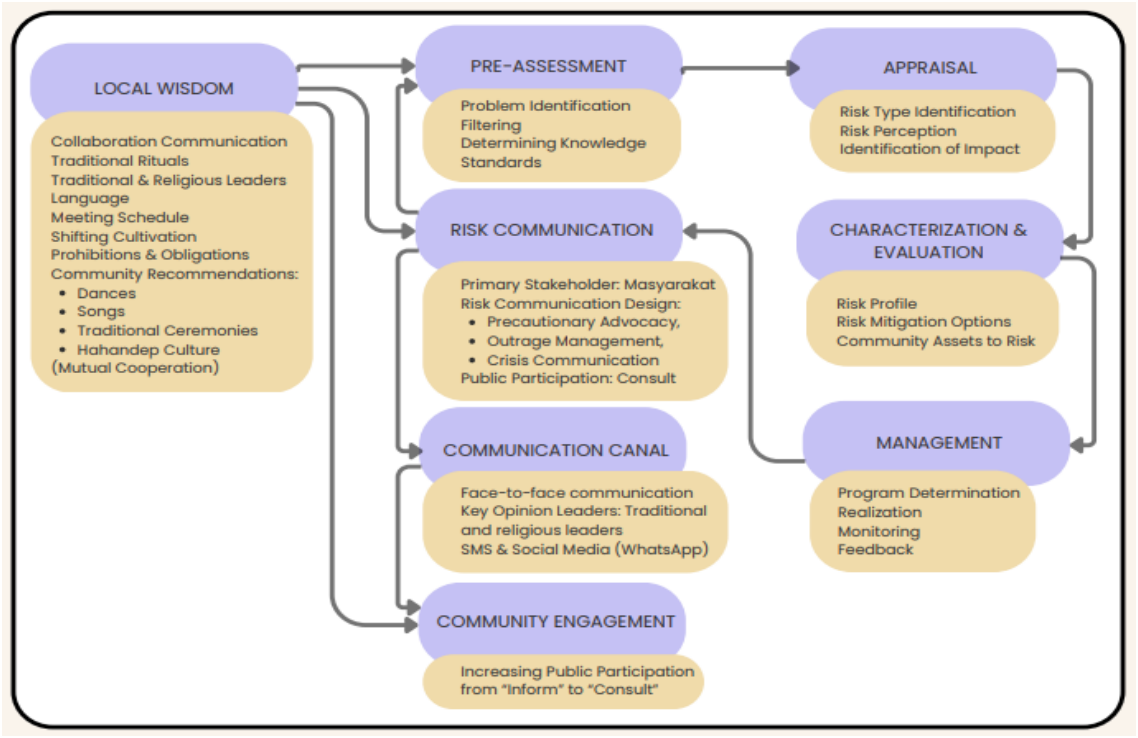

Fig. 4. PT MRC risk communication model, adaptation of the IRGC risk communication model (IRGC, 2017)

By embedding communication within existing rituals and social norms, the company achieves resonance and legitimacy that are often absent in top-down corporate communication models. This supports the argument that culturally sensitive communication improves stakeholder participation and long-term sustainability (Liu et al., 2016). On the other hand, the study also found significant sources of uncertainty in the implementation of PT MRC's Risk Communication activities. As a key instrument for ensuring that communities understand the rationale, outcomes, and decisions emerging from risk assessment and risk-management phases—and for enabling informed preventive actions—Risk Communication requires a well-designed organizational policy. For this reason, the planning dimension of Risk Communication becomes essential.

The importance of planning is particularly evident when examining PT MRC's communication objectives. However, risk is inseparable from uncertainty. The ISO 31000:2018 Risk Management Guideline defines risk as *"the effect of uncertainty on organizational objectives"*, and uncertainty as a *"state, even partial, of deficiency of information related to an event, its consequences, or its likelihood"* (ISO, 2018). Accordingly, the first source of uncertainty in PT MRC's Risk Communication lies in its multiple and somewhat inconsistent objectives, which—as identified in the study—include: (1) bridging corporate interests and community land-ownership claims; (2) determining the actual risks faced by communities due to mining operations; (3) preparing for the next stages of corporate operations; (4) identifying approaches for addressing community-raised issues such as road blockades; (5) meeting recognition and award requirements from the Directorate General of Mineral and Coal; and (6) gaining social acceptance from local communities. Ensuring coherence among these objectives is therefore crucial.

Uncertainty in Risk Communication may also arise from community conditions shaped by socio-cultural dynamics and distrust. This relates to communication uncertainty, where problems may emerge from how messages are interpreted, the credibility of information sources, insufficient information, slow dissemination, contradictory messages, and other forms of distortion. Thus, attention must be directed toward message format, spokesperson selection, and the communication channels used in the process. The study identified that PT MRC's Risk Communication messages focus on: (1) the company's presence in the area; (2) the positive and negative impacts of mining operations; and (3) risk-mitigation measures.

Community responses to these messages were subsequently assessed to inform appropriate program planning.

As for spokespersons, PT MRC appointed two representatives from the Operational Team: a consultant responsible for Social Mapping and a community-based facilitator. To reduce uncertainty, this Operational Team also developed a communication guideline submitted to the company. Communication channels include direct meetings, customary institutions such as the Dayak Customary Council (DAD), local mass organizations such as TBBR, as well as religious and traditional leaders. Message formats, spokesperson credibility, communication guidelines, and channel selection are all linked to cultural differences. Communication, fundamentally, is a cultural process. Communication failures often stem from linguistic barriers and culturally specific non-verbal cues. Not everyone is equipped to navigate intercultural differences, particularly between a corporate actor—perceived as an outsider—and local communities.

In relation to Risk Communication uncertainty, cultural differences between the company and local communities can strongly influence communication effectiveness. Thus, careful selection of message formats, comprehensive communication guidelines, and credible spokespersons and channels is imperative. Finally, PT MRC's contingency measures to address uncertainty and misinformation include, (1) three designated field persons-in-charge; (2) the use of technologies such as SMS and WhatsApp; (3) a corporate response strategy; and (4) the planned development of SOPs and corporate communication guidelines. These mechanisms are expected to reduce uncertainty in PT MRC's Risk Communication processes, as effective communication should enable problem-solving and foster community trust in the company's ability to assess and manage risks.

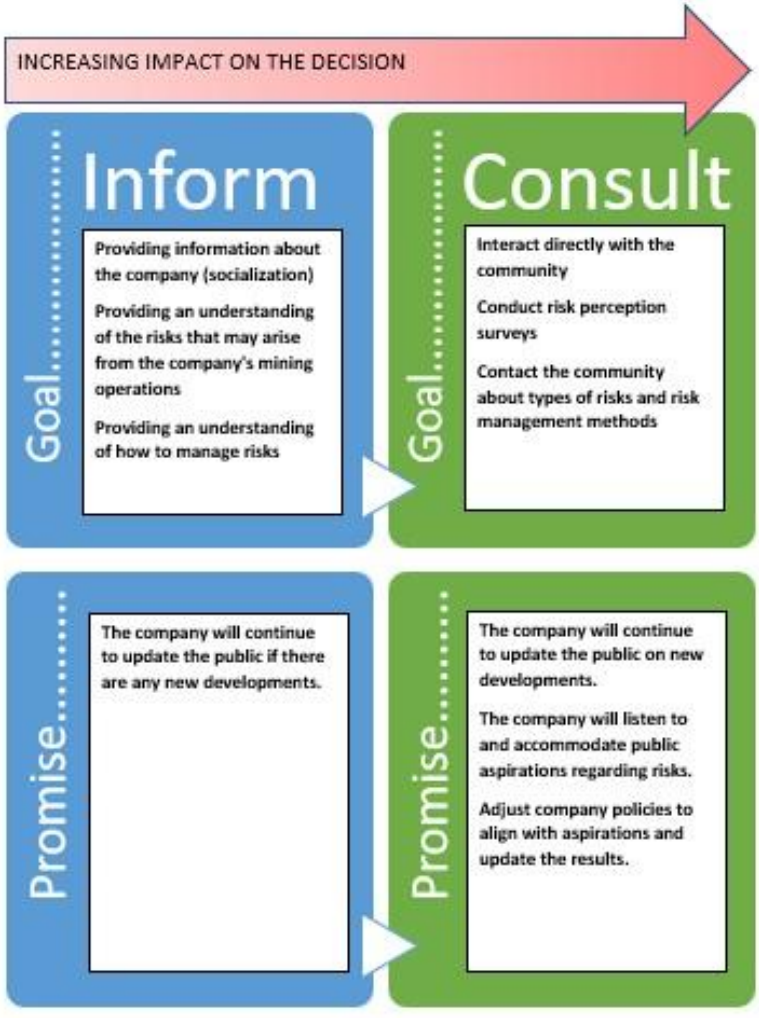

Fig. 5. Increased public participation in PT MRC risk communication

The analysis and mapping of community participation in Risk Communication is presented in Figure (5), which shows that: (1) PT MRC has recognized the importance of community involvement from the outset; (2) communities in Ring 1 of the mining area feel engaged and understand the risks and mitigation measures; (3) greater efforts are needed to engage communities beyond Ring 1; and (4) the company plans to expand its Risk Communication activities to Rings 2 and 3 of the operational area.

When this condition is applied to the public participation ranking model known as the *IAP2 Public Participation Spectrum*, it becomes evident that community involvement has progressed within the five-tier continuum—inform, consult, involve, collaborate, and empower. Specifically, the level of engagement has advanced from *Inform*, where communication is predominantly one-way, to *Consult*, where feedback and dialogue begin to shape corporate action. This shift signals a movement toward more participatory risk governance. This finding provides an important indication that Risk Communication strategies grounded in local wisdom can bridge the gap between corporate and community values, thereby reducing social risk. Nonetheless, it is acknowledged that constructing relationships among stakeholders within Community Engagement is inherently a long-term process, as it seeks to develop a shared vision capable of generating meaningful collective and individual benefits for all members of the community.

The findings of this study also suggest that the effective implementation of IRGC-based risk governance, when integrated with local wisdom, serves as a fundamental driver for establishing a resilient sustainability system within the mining operations. While this research primarily focuses on the mechanisms of risk communication and public participation, it is evident that these elements are not standalone processes. Instead, they provide the necessary social legitimacy and trust required for a functional sustainability system that balances industrial objectives with community well-being. By addressing local concerns through culturally-sensitive dialogue, the risk governance framework facilitates a long-term sustainability transition, ensuring that mining activities contribute to conflict-sensitive development and broader social-ecological resilience.

4. Conclusions

PT MRC's Risk Communication Strategy is tailored to the level of *Hazard* and *Outrage* associated with each risk category. Risk Communication related to land conflict is addressed through outrage management, issues concerning declining welfare through crisis communication, and risks pertaining to environmental pollution and health disturbances through precautionary advocacy. The integration of local wisdom—such as collaborative communication and the *Lapas Lewu* customary rituals—into the Risk Communication framework has enabled the company to advance its Community Engagement from the "Inform" level to the "Consult" level.

PT MRC's Risk Communication process is structured around four elements—*pre-assessment, appraisal, characterization & evaluation, and management*—which are interconnected across sectors. This study finds that Local-Wisdom-Based Risk Communication has become a *cross-cutting* element that links multiple activities within the model. Accordingly, this research emphasizes the importance of integrating local wisdom into corporate Risk Communication strategies, while also identifying several conditions that likely influence effective intercultural communication.

The experience of PT Murung Raya Coal illustrates that culturally embedded communication fosters community trust, reduces resistance, and builds the level of engagement necessary for sustainable operations. Theoretically, this study broadens existing Risk Communication frameworks by incorporating cultural and participatory dimensions. Practically, it offers a model for mining companies to align risk governance with local socio-cultural contexts.

Future research may explore cross-sector applications of culturally adaptive Risk Communication beyond the mining industry, including in public health initiatives or energy infrastructure projects. Emphasizing local participation not only fulfills ethical

communication standards but also strengthens social cohesion and resilience within resource-dependent communities.

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