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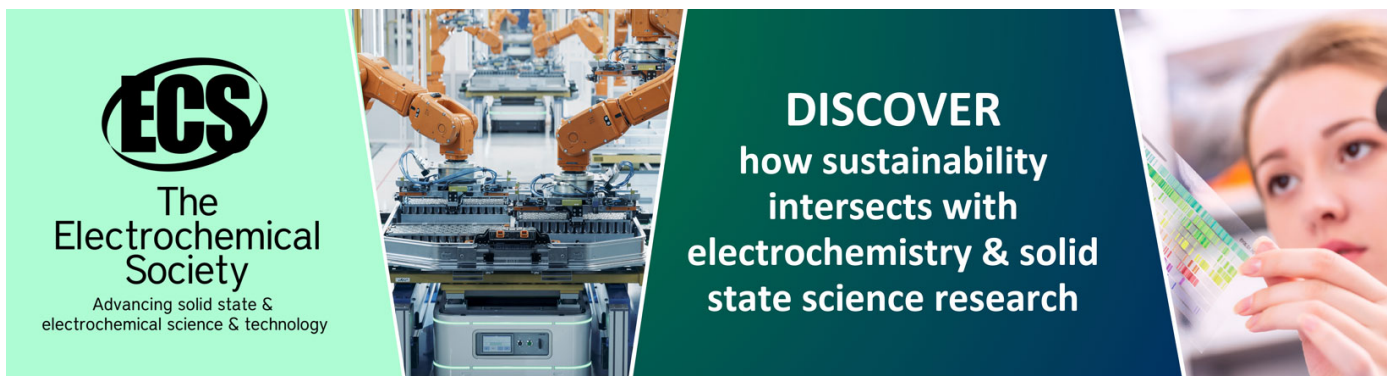
The Stakeholder's Position Map Related to the Mercury Pollution Reduction Program in Bombana Area, Southeast Sulawesi, Indonesia

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The Stakeholder's Position Map Related to the Mercury Pollution Reduction Program in Bombana Area, Southeast Sulawesi, Indonesia

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Abstract. The rapid expansion of the artisanal and small-scale gold mining (ASGM) industry in developing countries has resulted in occupational exposure to mercury via the gold extraction process. The objective of this study was to assess the knowledge, interest, position, and power of stakeholders for the implementation of the mercury pollution reduction program. This study involved ten stakeholders as representatives from different backgrounds in the Bombana regency. The results of the analysis show that the health department, environmental agency, and village head are stakeholders who have a high level of knowledge and interest in the program. The assessment based on position and partnership indicates that the health department and local university have high-level power/leadership and become the great potential supporter. Stakeholders with the potential to become opponent are traditional land owners, mining companies, and local activists. The priority strategy recommended from this study is to initiate active communication to stakeholders and create a clear guidance on the implementation of the program. Also, an effective approach is needed to create the mutually beneficial cooperation agreement to avoid provocation and conflict.

Keywords: Stakeholder; mercury pollution; artisanal and small-scale gold mining Bombana.

1. Introduction

The traditional gold mining and small-scale mining sector, as informal (illegal) mining is responsible for 37% of all anthropogenic mercury emissions in the environment. Mercury-based gold extraction has resulted in increased levels of various forms of natural mercury (Hg), such as elemental, organic, and inorganic elements [1-3]. In recent conditions, mercury exposure has the potential to cause intoxication and health problems to local miners in Bombana, with mercury hair levels reaching 12.82 µg Hg/g hair [4]. Meanwhile, the food chain process that allegedly occurred in the terrestrial environment in Bombana has resulted in mercury contamination in cattle herd breeding by local communities with mercury level reaching 11.44 µg/g hair [5].

The complex and dynamic nature of the environmental problems that occurred in Bombana requires a breakthrough in the form of mercury pollution reduction program which is a form of cooperation from various parties[6]. Program implementation requires support from stakeholders and decision-making based on flexible and transparent decision making[7]. Stakeholder participation in environmental



decision-making is crucial to get support from policy makers at local and national levels. For that reason, stakeholder analysis is needed to access the identify the key actors and to assess their knowledge, interests, positions, alliances, and importance related to the policy and the necessary formulation of strategies [8].

Basically, stakeholder analysis is the process of collecting and analyzing qualitative information systematically to map out the interests of whom to consider when developing and / or implementing a program [9]. Until now there have been no study results that provide a complete picture of the position of stakeholder positions in Bombana, although it can be predicted there will be donor agencies that will implement mercury pollution reduction program in the future. So the purpose of this study is to conduct a systematic analysis to map the position and potential participation of various stakeholders in Bombana. Specific targets to be achieved from this study are the birth map of stakeholder positions based on knowledge, interests, positions, alliances, and interests related to program implementation.

2. Material and method

2.2. Study area

The study was conducted in Bombana District, Southeast Sulawesi, Indonesia (Figure 1), where almost all stakeholders are located. We do sampling in this area, as it contains a traditional and small-scale gold mining development area that may have been contaminated by heavy metals, especially mercury.

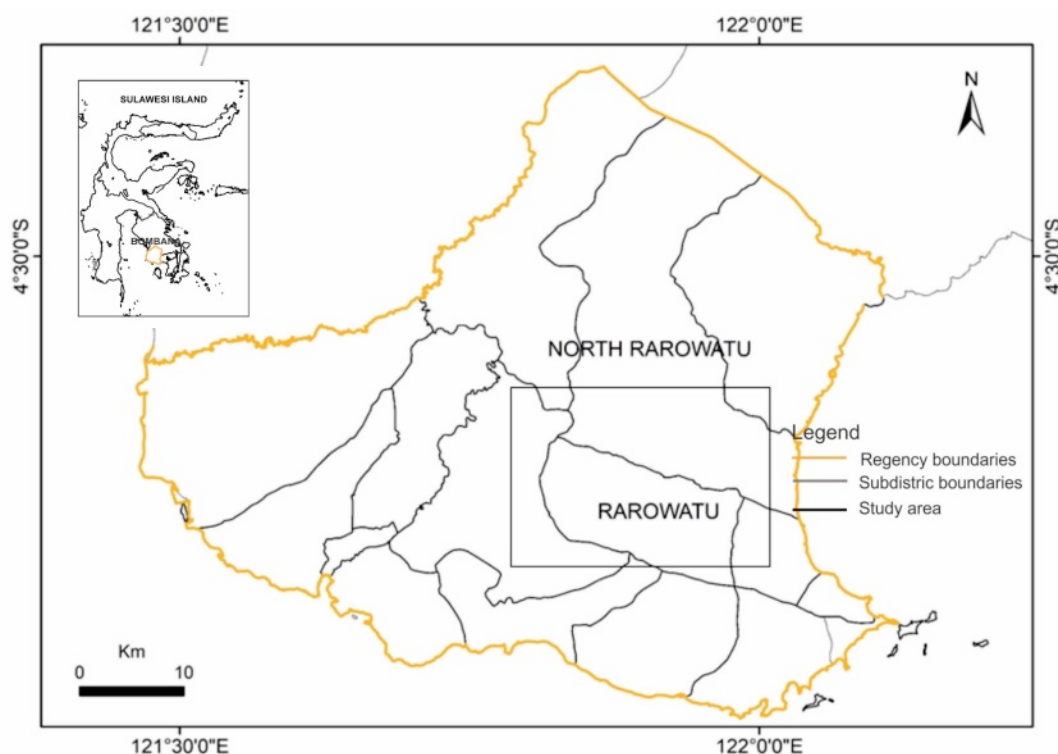


Figure 1. Map of Bombana regency displays the study area (modified from [10]).

2.3. Data collection

The data collection method adopts the protocol that has been developed by Schmeer (2000), through the stages; planning the process, identifying key stakeholders, adapting the tools, and collecting and recording the information [9].

2.3.1. Planning the process. The first step in conducting a stakeholder analysis is to define the purpose of the analysis, identify the potential users of the information, and devise a plan for using the information. A discussion of these issues should be led by the “sponsor,” or initiator, of the stakeholder analysis.

2.3.2. Identifying key stakeholders. Identifying the key stakeholders is extremely important to the success of the analysis. Based on the resources available, the working group should decide on the maximum number of stakeholders to be interviewed. The working group should then follow the steps below to define the list of stakeholders (beginning with an open list that can be reduced, if necessary).

Stakeholders of Bombana		Reason chosen/relation to policy
1	Health Department	Health department has programs and authorities to prevent the incidence of disease based mercury exposure in ASGM site
2	Environmental Agency	Environmental agency is responsible for monitoring and controlling the environmental damage caused by mining activities within Bombana district
3	Police Headquarter	Police headquarter is responsible for controlling security, preventing environmental destruction, and illegally controlling trade of mercury
4	Local University	Local university plays a role in conducting studies and assessing the policies and utilization of natural resources and its impact on the environment in Bombana
5	Department of mineral and energy and mineral resource	Department of mineral and energy and mineral resource is responsible for controlling the management of mineral and energy resources in Bombana
6	Educational Board	Educational board contributes to educating the environment on school-aged children in Bombana
7	Non-Profit Organization (NPO)	NPO became the third sector that controls Bombana government policy in relation to the use of natural resources in Bombana
8	Local leader	Local leader have a strong influence on the movement of miners, especially in the ASGM area of Bombana
9	Agency of Regional Development	Agency of regional development is responsible for regulating regional development planning, including developing regulations on the utilization of natural resources at Bombana
10	Mining company owner	Mining company owner has full authority over company policy and is responsible for the environmental impacts generated by the company
11	Local activist	Local activist play a role in overseeing the performance of local governments for the utilization of natural resources and their impact on the environment
12	Land owner	Landowner have authority over the sale and use of land for small-scale gold mining activities and under the management of mining companies

2.3.3. Adapting the tools. Generally, very little secondary information is available on stakeholders. As a result, the working group should plan to interview the priority stakeholders identified to gain accurate information on their positions, interests, and ability to affect the process.

2.3.3.1. Adapt stakeholder characteristics. Table 1 shows information or characteristics of stakeholders as a consideration in conducting interviews. Some characteristics of stakeholders will be elaborated through existing help tables; position and organization, knowledge of policy, Position, interest, alliances, resources, power and leadership.

Table 1. Stakeholder characteristic and table titles

A	B	D		E				F	G	H	I	J	
I.D	Position & Organization	Knowledge		Position			Interest		Allian- ce	Resources	Power	Leader	
		Level (1,2,3)	Definition	Self	Others	Final	Advantage	Disadvantage	Organizations mentioned	Quantity (3, 2, 1)	Ability to mobilize (3, 2, 1)	Resource average (3, 2, 1)	Yes / No
				S, MS, N, MO, O	S, MS, N, MO, O	S, MS, N, MO, O							

S: Supporter; MS: Moderate supporter; N: Neutral; MO: Moderate opponent; O: Opponent

2.3.3.2. Develop the interview questionnaire. In developing the questionnaire, the cultural context should be considered to obtain accurate information. Each questionnaire contains 42 questions that must be clearly stated, specific, and open when possible. Stakeholders do not have to complete the questionnaire itself, but the interviewer must use a questionnaire to guide the conversation during the interview. The preliminary section of the questioner contains instructions for the respondent. This section also contains the purpose of the interview, the identity of the interviewer, the information gathering procedure, and the assertion statement of stakeholders that all responses will remain anonymous. The definition and clarification of the mercury program reduction, however, should be provided only after the interviewer has explored and determined the level of stakeholder understanding and knowledge about the program.

2.3.4. Collecting and recording the information

2.3.4.1. Review the existing information. Secondary information gathering on priority stakeholders is conducted before the interview begins. Such information should be more detailed which describes the position of stakeholders in the implementation of the program, the influence of the organization held by the stakeholders, the position of stakeholders within the organization. In addition, data on the number or types of resources that stakeholders can mobilize is also very important.

2.3.4.2. Make interview appointments. To start the interview, time and location must be agreed upon first. In general, stakeholders have a high activity, then the promise should be made 1-2 weeks earlier. Where possible the researcher should seek help from sponsors or policymakers who support the meeting process. Rescheduling of interviews can be done to ensure interviews with the person being indicated and not the representative. If face-to-face interviews are not possible, then the process of extracting information can be done by telephone.

2.3.4.3. Conduct interviews and record notes. The interview process follows a pre-defined protocol, with one person as the main interviewer responsible for leading the conversation. Sometimes, if the stakeholders do not understand the question, then the interviewer can repeat a few questions, but deviations from the original questionnaire should be recorded. All interview records should be transferred to the computer. Separate electronic files should be created for each stakeholder containing the questionnaire and the answer for each question. This stage aims to record information accurately, legibly, and with question numbers to be used in the analysis process.

2.3.4.4. Filling in the Stakeholder Table. This stage is quite complicated because the interviewer must understand the detailed and often lengthy answers from the interview and organize them into a more concise and systematic format (for anonymity and illuminating the most important information). Through this process, researchers can ultimately formulate clear position maps between different stakeholders and briefly become information for policymakers who will use them. All interview results must first be translated, and transferring interview responses to stakeholder table forms require the working group to use all the tools developed: completed interview guides for each stakeholder, reference chart, definitions, and stakeholder tables.

2.3.4.5. Analysing the stakeholder table. After completing the stakeholder table, the summary of the information should be analysed. The outcomes that can be obtained from this analysis are information about the relative importance, knowledge, position, and possible related allies regarding the policy. The end result of this stage is to get an important conclusion; who are the most important stakeholders (from strength and leadership analysis), how stakeholders' level of knowledge about the program, how strong the position of stakeholders in supporting the program. In addition, stakeholder perceptions of the likely advantages or disadvantages of implementing such policies and who may potentially be alliances will be obtained.

4. Result

4.1. Power/leadership analysis

The results of the data analysis will be divided into the three groups based on power / leadership as important conclusions of the first objective of the analysis. The group mapping represents potential stakeholders to influence the success of the mercury reduction program (Table 2).

Table 2. Stakeholder position based on power/leadership related to the mercury pollution reduction program in Bombana, Southeast Sulawesi

Group 1: Leadership & High (3) Power	Leadership & Medium (2) Power	No Leadership & But Medium or High Power
Health Department	Environmental Agency	Department of Energy and Mineral resources
Local University	Police Headquarter	Local Activist
Mining company owners	Agency of Regional Development	Land owners
	Educational Board	
	Non-Governmental Organization	
	Local leader	

4.2. Stakeholder alliance analysis

Stakeholder alliance analysis results in a position map that can quickly illustrate which actors support or oppose a program implementation, how strong the support or opposition to influence the success of the program, and where the stakeholders are sector-based (Table 3).

Table 3. The position of stakeholder relating to the mercury pollution reduction program in Bombana, Southeast Sulawesi

Support		Neutral	Opposition	
High	Moderate		High	Moderate
Health Department	Policy Headquarters	Department of Energy and Mineral Resource		Mining Company Owners
Environmental agency	Agency of Regional Development	Local leader		Land Owners
Local university	Educational Board			Activist
	Non-Governmental Organization			

4.3. Stakeholder knowledge level analysis

The results of data analysis are presented in three groups: low, medium and high (Table 4). Graphical representation of these three categories of knowledge is beneficial for combining interest information in the next table. This grouping provides essential information for the reader of the stakeholder knowledge level.

Table 4. The stakeholder knowledge level relating to the mercury pollution reduction program in Bombana, Southeast Sulawesi

Knowledge Level		
Group 1: Low	Group 2: Medium	Group 3: High
Policy Headquarters	Agency of Regional Development	Health Department
Mining Company Owners	Local University	Environmental Agency
Local Activist	Educational Board	Local leader
Land Owners	Non-governmental Organization	
Department of Energy and Mineral Resource		

4.4. Stakeholder interest level analysis

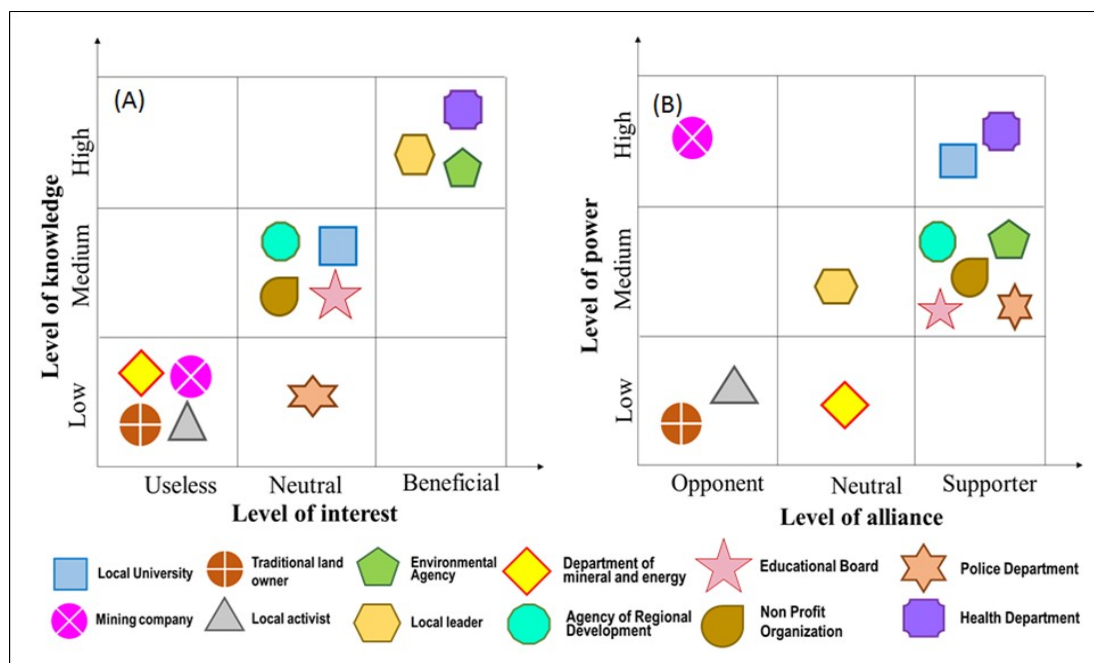
Level interest describes the level of interest of stakeholders to engage in mercury pollution reduction program[11]. The results of the analysis are divided into three categories: low, neutral and high and represented in the interest level table (Table 5).

Table 5. The stakeholder interest level relating to the mercury pollution reduction program in Bombana, Southeast Sulawesi

Interest Level		
Group 1: Low	Group 2: Neutral	Group 3: High
Department of Energy and Mineral Resource	Agency of Regional Development	Health Department
Mining Company Owners	Local University	Environmental Agency
Local Activist	Non-governmental Organization	Local leader
Land Owners	Educational Board	
	Policy Headquarters	

4.5. Cross-analysis of stakeholder position map

The cross analysis is done to obtain the development of results and can provide relevant recommendations for policymakers about the implementation of the program. The following is a cross-sectional simulation between the level of knowledge and the level of interest of stakeholders. In comparison, cross-references are also conducted between the level of power and the level of an alliance of stakeholders (Figure 2).

**Figure 2.** The cross-analysis of stakeholder position relating to the mercury pollution reduction program

Local leader, environmental agency and local university with high level of knowledge and high interest are the most potential to be improved. These three stakeholders have a knowledge about the impact of mercury pollution because of their academic background, bureaucracy, and social interaction. Also, they

understand the social and environmental advantages when mercury pollution reduction is applied in Bombana. Meanwhile, local leader, environmental agency and local university with high level of knowledge and high interest are most potential to be improved.

5. Discussion

5.1. Power/leadership analysis

Basically, "power" owned by stakeholders is defined as a combination of the number of resources controlled by stakeholders and their capacity to mobilize them. So to get the power index, the resource value for each stakeholder should be averaged. The power index is in categories 1 to 3, of which 3 = high power, 2 = medium power, and 1 = low power. The existence of resources is indicated by the number of resources held by the stakeholders within its organization or territory and the ability to mobilize those resources. The next step is to classify the resources into 3 categories: 3 = many, 2 = few, 1 = few. While the stakeholder's ability to mobilize resources should be counted three conditions: 3 = stakeholders can make decisions to support the implementation of a program, 2 = stakeholders are one of the teams authorized to formulate the decision to mobilize resources, and 1 = stakeholders do not have the authority to make decisions regarding the use of resources.

The analysis shows that Health department, local university and mining company owners have high leadership and power. Each respondent representing stakeholders has a strategic position in the organization. Their position is generally the highest decision makers, so they can mobilize their resources to support the implementation of the mercury reduction program. Continuous environmental improvements can be created by stakeholders who have high proactiveness, and have relevance to the interests of stakeholders [12]. In developing countries including Indonesia, environmental leadership is not related to environmental regulations, but rather the role of voluntary cooperation between companies and governments is required [11].

5.2. Stakeholder alliance analysis

Some of the decisive aspects of analysing stakeholder position information from the auxiliary table relate to the implementation of the program. These points include the comparison of the number of supporters and opponents, the importance of supporters and adversaries, the level of knowledge about supporters and adversaries, the advantages and disadvantages of program implementation for supporters and against. Also, groups that are categorized as neutral regarding interests, knowledge, and interests should also be considered.

Health department, environmental agency, local university, policy headquarters, the agency of regional development, educational board and NGOs are stakeholders. Meanwhile, mining company owners, landowners and local activists could potentially be opposition to the application of mercury reduction program in Bombana. This alliance difference is influenced by the dynamic of power relationships between the government and the group that claims to have rights in the management of mining resources at Bombana [13]. In addition, there is a conflict of interest between stakeholders due to unclear regulations regulating the decentralization of authority of environmental resource management [14].

5.3. Stakeholder knowledge level analysis

The level of knowledge of stakeholders is crucial in determining whether or not to engage in a program. In the process of information analysis, stakeholders are divided based on their level of knowledge (1, 2 and 3). This grouping can identify low-knowledge targets that require a specific approach to engage in a program. Knowledge level information when crossed with power/leadership data or stakeholder positions can explain whether those who support or oppose the plan have a relationship with their level of knowledge.

The level of knowledge of stakeholders will determine the decision-making process, especially in uncertainty conditions. High understanding of the environmental benefits and disadvantages of

participation in the implementation of mercury reduction program becomes a preference for stakeholders to make decisions [15]. From the data analysis put Health department, environmental agency and local leader have the high knowledge to program. Meanwhile, police headquarters, mining company owners, landowners, and the office of energy and mineral resources have the low understanding of program objectives. Middle knowledge is owned by three stakeholders; an agency of regional development, local university, educational board and NGO.

5.4. Stakeholder interest level analysis

Interest data may be used alone as a general conclusion or cross-analysis by obtaining the development of results. When cross-referencing data interest with other data, the advantages and disadvantages of implementing policies identified by stakeholders can be used to explain their position or to emphasize their knowledge of the system. In other simulations, interest data is also cross-linked with data on power/leadership data, giving direction for stakeholders to take a decision related to the implementation of a program.

The analysis shows three stakeholders are in the high-interest level; health department, environmental agency, and local leader. Low-level interest is expressed by the department of energy and mineral resources, mining company owners, local activists, and landowners. While the agency of regional development, local universities, NGOs, educational boards, and policy headquarters are at the neutral level. Their high and low-interest rates are determined by the high level of knowledge on the benefits of participation in mercury reduction programs [16].

6. Conclusion

This study was initiated to assist individuals, working teams, and funders to access stakeholder knowledge, interests, positions, and strengths for the implementation of the mercury pollution reduction program at Bombana. In the end, local policymakers and government in Bombana can use stakeholder analysis to identify key actors and to assess their knowledge, interests, positions, alliances, and interests related to program implementation. A deep understanding of stakeholder position maps allows for synergy between program initiators, policymakers and local governments with stakeholders to create support for specific policies or programs. The result of the analysis concludes that local leader, environmental agency and local university with high level of knowledge and high interest are most potential to be improved. Meanwhile, local leader, environmental agency and local university with high level of knowledge and high interest are most potential to be improved.

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