

# GUIDELINES FOR MINING MANAGEMENT IN THE SOCIAL SCIENCE DIMENSION OF INDUSTRIAL CERAMIC MATERIALS

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## ABSTRACT

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The study of guidelines for mining management in the social science dimension of industrial ceramic materials aimed to examine the following aspects: 1) The social impact of mining management, 2) the factors and criteria used to determine potential mining areas, and 3) guidelines for mining management in the social science dimension of industrial ceramic materials. The researchers conducted the social impact indicators by applying the framework of Mancini and Sala (2018) and Wattanachaiyingcharoen (2010). For the case study, two types of ceramic mineral resources were considered: feldspar and kaolin. Feldspar mining in Tak Province and kaolin mining in Lampang Province, Thailand showed the highest potential and were, therefore, chosen for the data collection and field study. A qualitative method with a focus group discussion and public hearing was used in this study to identify both the positive and negative social impacts resulting from industrial ceramic material operations, and ways to prevent and resolve the social impacts occurring within the respective areas. In addition, a quantitative method with a questionnaire survey was conducted in the potential areas to assess the level of the social impacts on local mineral management and public participation in social impact management. The results indicated that the main factors determining the areas where mining operations were previously conducted, included generating income for the community, increasing employment, development of labor skills, increased quality of life for the local people, and community participation in mining management. Guidelines for future mining management of industrial ceramic materials were identified as employment promotion, development of labor skills, and the provision of occupational health and safety for the workers. Collaborating with various network partners to manage social impacts would also be necessary to improve acceptance and understanding.

**Keywords:** Ceramic mining; guidelines for mining management; social impact

## 1. INTRODUCTION

Mineral resources are very important for a country's economic development. In Thailand, mineral resources benefiting the national economy include industrial ceramic materials like feldspar and kaolin. These

raw materials have been developed continually to support the national economy. However, mineral development also adversely impacts the environment and public health. Mining creates wealth for the community but may also cause conflicts in society if the benefits and expenses are disproportionate. Moreover, if the community feels that they have been treated unfairly or not received sufficient compensation, this may lead to social tension and violent conflicts (Environmental Law Alliance Worldwide, 2010). Hence, a Social Impact Assessment (SIA) can evaluate both the direct and indirect impacts of social development policies and projects caused by mining operations and the related development.

An SIA allows groups of stakeholders to access the social problems and understand both the positive and negative impacts while initiating and implementing measures to monitor and evaluate any social changes (Wattanachaiyingcharoen, 2010). Social solutions can thus be proposed to meet the community's needs, promote participation, and prepare strategies for any changes and development. As such, the social impact must be assessed when determining the potential mining areas with social science guidelines established for mineral management.

Social dimension factors are important when determining future potential mining areas, and these can be classified into the economy, income, security, employment, education, demography, and human rights. Development of mining areas also requires appropriate mechanisms and guidelines, especially in the social science dimension of industrial ceramic materials to ensure parity in the community and all the relevant sectors. Therefore, mining operations must be sustainable and maximize the efficiency of mineral resource management through balancing conservation and development.

This research has three objectives:

- (1) Investigate the social impact of mining management.
- (2) Evaluate the factors and criteria used to determine potential mining areas.
- (3) Examine the guidelines for mining management in the social science dimension of industrial ceramic materials.

## 2. MATERIALS AND METHODS

For this research in Thailand, two types of ceramic mineral resources were examined: feldspar and kaolin. Information was sourced concerning the applications for mineral resource concessions for licensing and special licenses following the rules and procedures under Office of the Council of State (2017). Feldspar mining in Tak Province and kaolin mining in Lampang Province showed the highest potential and were, therefore, chosen for the data collection and field study. The research methodologies were as follows:

### 2.1 Qualitative research

The qualitative research included focus group discussions with 20 stakeholders (Nayab, 2017) as key informants in each area composed of community leaders, relevant government agencies, companies operating mining activities, as well as the affected people.

In Tak Province, a focus group discussion was conducted covering three potential areas: 1) Wang Chan Subdistrict, Sam Ngao District, 2) Pong Daeng Subdistrict, Mueang Tak District, and 3) Wang Prachop Subdistrict, Mueang Tak District. The 25 key informants consisted of nine local people in the area, seven community leaders, seven government sector representatives, and two mining company representatives. A focus group discussion was also conducted in Lampang Province covering four potential areas: 1) Ban Sa Subdistrict, Chae Hom District, 2) Mueang Mai Subdistrict, Chae Hom District, 3) Nikhom Phatthana Subdistrict, Mueang Lampang District, and 4) Bunnak Phatthana Subdistrict, Mueang Lampang District. The 24 key informants were composed of five local people in the area, six community leaders, four government sector representatives, and nine mining company representatives.

The qualitative research tool was the focus group discussion form with the verified content validity. Content analysis was undertaken to identify both the positive and negative social impacts resulting from industrial ceramic material operations, and ways to prevent and resolve social impacts occurring within each area.

### 2.2 Quantitative research

A questionnaire survey was conducted in the potential areas to assess the level of the social impacts on local mineral management and public participation in social impact management.

The population comprised the local people living in the two potential mining areas of Tak Province (654,676 people) and Lampang Province (744,541 people) (Bureau of Registration Administration, 2020). Four hundred samples were assigned to Yamane's formula (Yamane, 1967) in each area (total of 800 samples). Multistage purposive sampling was conducted to select the study areas with proportional stratified random

sampling to choose the sample groups in all districts using the accidental and snowball sampling methods. A questionnaire was used as a research instrument with the content being verified for validity and reliability. The Index of Consistency (IOC) of the questionnaire was 0.67-1.00 and considered to pass the criterion. The reliability analysis gave an alpha value of 0.97 inferring that the questionnaire was reliable. Descriptive statistics including percentage, frequency, average, and standard deviation were used for the data analysis.

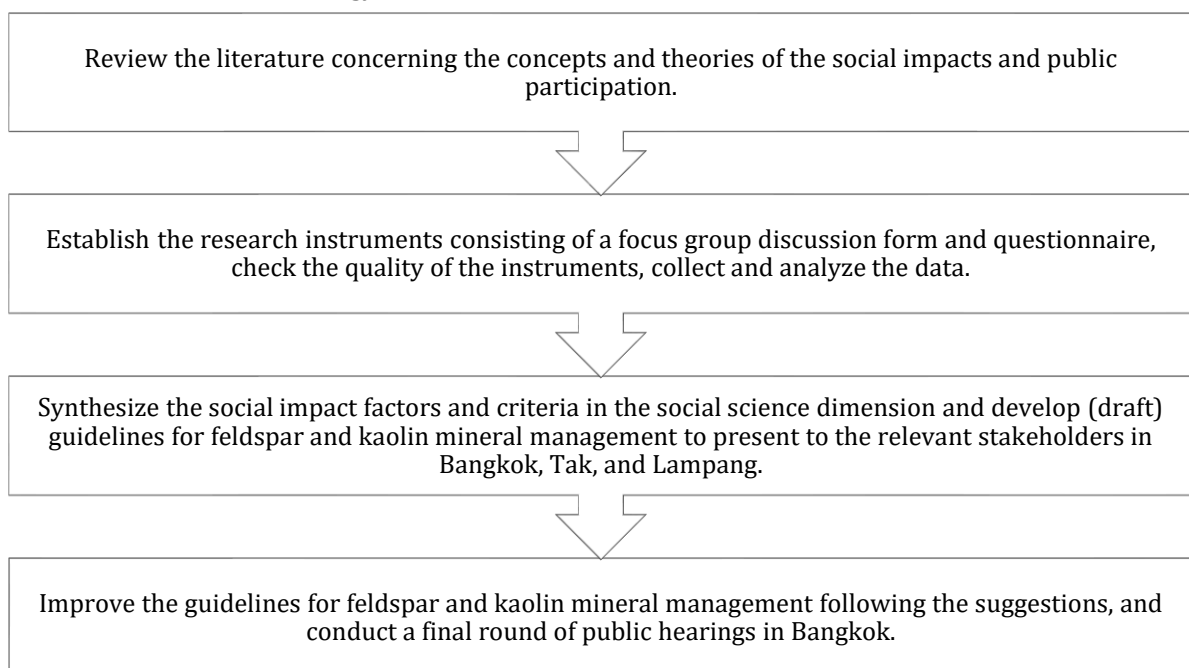
### 2.3 Public hearing

A public hearing was the final data collection method in which the researchers listened to suggestions of the mining management in the social science dimension of industrial ceramic materials. The public hearing process was as follows:

1) A meeting was organized to collect the opinions and suggestions of the stakeholders consisting of the public and private sectors, and NGOs or third-party sectors toward the (draft) guidelines for feldspar and kaolin mineral management in the social science dimension. The public hearings covered three areas consisting of 1) Bangkok with at least 100 participants, 2) Tak Province, and 3) Lampang Province, both with at least 60 participants, respectively.

2) Guidelines were established for mineral management in the social science dimension for two types of industrial ceramic materials: feldspar and kaolin. A meeting was convened in Bangkok to gather the final opinions and suggestions of the stakeholders with at least 100 participants.

The research methodology can be summarized as follows:



**Figure 1:** Research Methodology Process

## 3. RESULTS AND DISCUSSION

A document was compiled by Mancini and Sala (2018) to study the framework of social impact indicators in the mining sector, while Wattanachaiyingcharoen (2010) examined the concept of the SIA at the community level. The results were classified according to the following objectives.

### 3.1 Social impact of mineral management

Factors for determining the social impacts were synthesized as follows: 1) Economic and income factors that included increased mining revenue, opportunity to generate income, poverty reduction, income inequality, and burglary risk. 2) Employment and education factors; such as, direct and indirect employment, opportunities for skills development, alien labor migration, and child labor. 3) Land use factors; such as, infrastructure management, promoting access to health and education, land expropriation, and land access. 4) Demographic factors; such as, population growth, gender imbalances, prostitution, gender and family violence, and changes in the social norms. 5) Community factors and ways of life of the local people, such as new social classes and religion. 6) Environmental, health, and safety factors, such as use of water for farming,

contamination of various substances, and impact on health and the environment. 7) Human rights factors, such as human rights violations, community involvement, and social inequality. Factors of public participation (Burikun, 2005) were also examined to study the guidelines for mineral management services consisting of participation in 1) information awareness, 2) consultation, 3) meetings and hearings, 4) decision-making, and 5) tracking and receiving mutual benefits. Social impacts on mineral management were presented in the following areas:

### 3.1.1 Feldspar mining area in Tak Province

Focus group discussions with the stakeholders in all the three selected areas of this province found that people were aware of the effects of mining operations since the feldspar mine was located close to the community. Mining operations resulted in improved living standards and employment at more than 90% of the total company's workforce, who had a regular income. Most of the people in the area were employed or had family members working in the mining companies, who coordinated awareness and understanding of the mining operations by communicating social impact preventive measures. Community leaders also ensured coordination to reduce conflicts and improve the living conditions.

The quantitative research suggested that public opinion on the social impact of feldspar mining in Tak Province was at a low level ( $\bar{x} = 1.91$ ;  $SD = 0.764$ ). Additionally, individual factors were addressed as follows:

Economic and income factors: Public opinion was at a low level ( $\bar{x} = 2.06$ ;  $SD = 0.855$ ). People had the highest opinion on the issue "Having mining in your area could increase your income?" ( $\bar{x} = 2.98$ ;  $SD = 1.083$ ).

Employment and education factors: Public opinion was at a low level ( $\bar{x} = 2.08$ ;  $SD = 0.830$ ). People had the highest opinion on the issue. "Having mines in your area would result in increased direct and indirect employment in the community?" ( $\bar{x} = 2.90$ ;  $SD = 1.160$ ).

Land use factors: Public opinion was at a low level ( $\bar{x} = 2.25$ ;  $SD = 0.804$ ). People had the highest opinion on the issue "Having mines in your area would affect the management of the infrastructure in the community/province (telecommunications, networks, roads, energy, and water resources)" ( $\bar{x} = 2.90$ ;  $SD = 1.003$ ).

Demographic factors: Public opinion was at the lowest level ( $\bar{x} = 1.64$ ;  $SD = 0.710$ ). People had the highest opinion on the issue "Population growth from mining causes chronic alcohol or drug addiction among people in the community." ( $\bar{x} = 1.74$ ;  $SD = 0.868$ ).

Community factors and ways of life of the people in the community: Public opinion was at the lowest level ( $\bar{x} = 1.72$ ;  $SD = 0.776$ ). People had the highest opinion on the issue "Having mines in your area would result in changes in community activities, such as village meetings or annual events?" ( $\bar{x} = 1.86$ ;  $SD = 0.850$ ).

Environmental, health, and safety factors: Public opinion was at a low level ( $\bar{x} = 1.83$ ;  $SD = 0.923$ ). People had the highest opinion on the issue "Having mines in your area would affect the anxiety of people in the community and may cause mental health problems, such as depression?" ( $\bar{x} = 1.95$ ;  $SD = .983$ ).

Human rights factors: Public opinion was at a low level ( $\bar{x} = 1.82$ ;  $SD = 0.884$ ). People had the highest opinion on the issue "Having mines in your area would lead to increased participation of people in the community?" ( $\bar{x} = 1.89$ ;  $SD = 0.962$ ).

Regarding the issue of public participation in social impact management, public opinion was at a low level ( $\bar{x} = 2.31$ ;  $SD = 1.098$ ). People had the highest opinion on the issue "Being informed about the details of the project that the mining would carry out and the expected impact." ( $\bar{x} = 2.49$ ;  $SD = 1.303$ ).

### 3.1.2 Kaolin mining in Lampang Province

Focus group discussions with the stakeholders in all the four selected areas found that Lampang Province had the potential for various types of mineral mining with concessions obtained for kaolin, coal, and other minerals. Thus, it was difficult to clearly identify the social impact solely from kaolin mining. In Lampang Province, the ceramic industry provides employment, and people have a good income. However, selected potential areas of kaolin mining offered less employment with reduced income for the local residents. Transportation of kaolin and other minerals also caused road damage with dust, dirt, and sand from the trucks increasing accidents in the relevant areas. Social impact preventive measures were not formally implemented although the relevant sectors, including government agencies, entrepreneurs, and community leaders tried to solve these problems. Hiring local residents promoted public relations and generated income, and all kaolin mines had pollution control measures. Truck tires were washed before using the public roads with staff employed to clean the road surfaces. However, the information output and public relations of the mining company were not thorough resulting in a lack of awareness regarding the mining operations. The management attempted to engage with the local community to manage the impacts in both social and other areas by appointing committees from various sectors to collect information, express opinions, and publicize the results.

Quantitative research determined public opinion at a low level of social impact for kaolin mining in Lampang Province ( $\bar{x} = 1.96$ ; SD = 0.731). Each factor can be explained as follows:

Economic and income factors: Public opinion was at a low level ( $\bar{x} = 2.05$ ; SD = 0.831). People had the highest opinion concerning the issue "Having mines in your area would be considered a business opportunity and generate income for the community/province?" ( $\bar{x} = 2.79$ ; SD = 1.159).

Employment and education factors: Public opinion was at a low level ( $\bar{x} = 2.08$ ; SD = 0.830). People had the highest opinion about the issue "Having mines in your area would result in increased direct and indirect employment in the province?" ( $\bar{x} = 2.93$ ; SD = 0.992).

Land use factors: Public opinion was at a low level ( $\bar{x} = 2.37$ ; SD = 1.152). People had the highest opinion on the issue "Having mines in your area would result in limited access to land, affect the people's livelihood, food, and housing insecurity?" ( $\bar{x} = 2.81$ ; SD = 1.228).

Demographic factors: Public views were at the lowest level ( $\bar{x} = 1.64$ ; SD = 0.710). People had the highest opinion on the issue of "Having mines in your area would affect population growth?" ( $\bar{x} = 2.11$ ; SD = 1.135).

Community factors and ways of life of people in the community: Public opinion was at the lowest level ( $\bar{x} = 1.71$ ; SD = 0.798). People had the highest opinion on the issue of "Having mines in your area would result in changes in community activities; such as, village meetings or annual events?" ( $\bar{x} = 1.81$ ; SD = 0.951).

Environmental, health, and safety factors: Public opinion was at a low level ( $\bar{x} = 2.39$ ; SD = 1.115). People had the highest opinion on the issue of "Having mines in your area would affect the health and safety in the communities/provinces; such as, mine blasts?" ( $\bar{x} = 2.73$ ; SD = 1.498).

Human rights factors: Public opinion was at a low level ( $\bar{x} = 2.06$ ; SD = 0.989). People had the highest opinion on the issue of "Having mines in your area would cause human rights violations; such as, freedom of expression?" ( $\bar{x} = 2.09$ ; SD = 1.297).

Regarding participation in the management of social impacts, public opinion was at a low level ( $\bar{x} = 1.94$ ; SD = 0.719). People had the highest opinion on the issue of "Being informed before the decision to proceed with the mining project and management of social impacts of the mining area." ( $\bar{x} = 2.14$ ; SD = 0.899).

Active participation by people in the community was vital to ensure that mining operations were efficient, sustainable, and environmentally friendly. Therefore, the participation process should start with informative publicity, provision, and collaboration to create stakeholder engagement and lead to mutually acceptable decisions. Office of the Council of State (2017) emphasized the participation of mining stakeholders. The information disclosure process requested a concession certificate with subsequent hearings to consider granting a concession for the mining operations. This certificate granted the rights to stakeholders to make decisions or participate in the monitoring of social impacts and other dimensions resulting from mining operations, including recommendations for policies and regulatory amendments that could affect the communities and the environment.

As a consequence, the owner of the mining company had to build trust in the community through integration, and consider the goals or needs of each stakeholder group in planning the operational decisions. Hence, the implementation of the activities must be allowed for stakeholders with different needs.

Encouraging local labor employment was another essential factor followed by management guidelines for industrial ceramic materials. Mining entrepreneurs had to specify the proportions of the local and non-local labor. Public relations exercises to recruit workers through local government units in essential locations would create awareness. Aside from generating income for the community, creating understanding and public relations about various mining operations was another approach to empower ownership of the local people.

When recruiting local workers, entrepreneurs would need to develop different skills requiring diverse expertise. Thus, entrepreneurs may need to develop skills in accounting or marketing by sending the workers on relevant courses conducted by the private sector or government agencies. Measures to manage the occupational health and safety of workers should be emplaced following the Occupational Safety and Health Risk Assessment Standard (SHS 402: 2018) (Thailand Institute of Occupational Safety and Health (Public Organization), 2018b), or the Occupational Safety and Health Management System Standard (SHS 401: 2018) (Thailand Institute of Occupational Safety and Health (Public Organization), 2018a).

### 3.2 Factors and criteria used in determining potential mining areas

Factors used for mining management in the social science dimension highly impacted people in the community, together with the results of the focus group discussions. The criteria and weight values of the mineral resources in the social science dimension adhered to the Thailand Mineral Framework Classification (TMFC) (Department of Mineral Resources, 2019) guidelines as a weighting of 15 out of 100 points. The factors and criteria used in mining management were classified into two categories: 1) areas previously mined, and 2) areas not mined before.

### 3.2.1 Factors and criteria used in mine management for areas previously mined

Five factors were examined for areas previously mined to assess the social impacts of the mining operations. The weight values were determined, as shown in Table 1.

**Table 1:** Weight Values of Mining Management for Areas Previously Mined

Factors for Areas Previously Mined	Weight Value
Generating income for the community	2
The proportion of employment in the area from the ceramic mining business	4
Skills development relating to ceramic mining	2
Quality of life of the local community	3
Community participation in mining management	4
<b>Total</b>	<b>15</b>

The weight value of each factor was considered from the survey results of public opinion regarding the factors and issues that highly impacted participation in mining management and the results of the focus group discussions. The proportion of employment in the area from the ceramic mining operations and community participation in mining management greatly affected the local population through the increased quality of life, income generation, and development of labor skills.

When determining the potential for feldspar and kaolin mining in the dimension of the social sciences, the score was calculated based on the different weight values of the five social sciences factors as follows:

#### 3.2.1.1 Factors generating income for the community (weight value = 2)

The mining companies had to generate income or business opportunities for people living in the community. The income was calculated as the income of all households in the area from mining company activities per year/total household income per year \* 100. The details of each criterion are presented in Table 2.

**Table 2:** Criterion of Generating Income for the Community

Criterion	Score	Points (Score * Weight Value)
Community revenue increased by more than 50% p.a.	4	8 (4*2)
Community revenue increased by 36-50% p.a.	3	6 (3*2)
Community revenue increased by 21-35% p.a.	2	2 (2*2)
Community income increased by at least 20% p.a.	1	2 (1*2)

#### 3.2.1.2 Proportion of employment in the area from ceramic mining business (weight value = 4)

This factor considered the number of workers in the area hired directly or indirectly by the mining company. Employment of local labor encouraged participation between the community and the mining company. The calculation of each criterion was determined as the number of workers in the community hired by the mining company/total number of workers \* 100 as shown in Table 3.

**Table 3:** Criterion of the Proportion of Employment in the Area from the Ceramic Mining Business

Criterion	Score	Points (Score * Weight Value)
Employment in the area was more than 70%	4	16 (4*4)
Employment in the area was 51-70%	3	12 (3*4)
Employment in the area was between 21% and 50%	2	8 (2*4)
Employment in the area was less than or equal to 20%	1	4 (1*4)

#### 3.2.1.3 Skill development factors related to ceramic mining (weight value = 2)

This factor considered the number of laborers who developed skills related to ceramic mining. The calculation of each criterion was determined as the number of workers with labor-related skills in ceramic mining/total number of ceramic mining workers in the province \* 100 as shown in Table 4.

**Table 4:** Criterion of Skills Development Relating to Ceramic Mining

Criterion	Score	Points (Score * Weight Value)
More than 70% of the workers in the area received the relevant skills development.	4	8 (4*2)
Between 51% and 70% of the workers in the area received the relevant skills development.	3	6 (3*2)
Between 21% and 50% of the workers in the area received the relevant skills development.	2	4 (2*2)
Less or equal to 20% of the workers in the area received relevant skills development.	1	2 (1*2)



### 3.2.1.4 Factors of the quality of life for the local community (weight value = 3)

This factor considered 1) the promotion of the quality of life for the people working in ceramic mining, including improvement of public utilities in the surrounding areas used for mineral transportation by creating warning signs when digging, drilling, or transporting minerals. 2) Providing activities or funds to assist people affected by the mining operations. 3) Promotion of public facilities through the provision of mobile health services, promotion of religious activities and traditions in the community, or scholarships for children in need, including supporting various school activities. The calculation of each criterion for this factor was performed using the 15 checklist questions concerning the above issues as the number of items that "have"/15 \* 100. The ratios of the scores as shown in Table 5.

**Table 5:** Criterion of Quality of Life of the Local Community

Criterion	Score	Points (Score * Weight Value)
The local community was encouraged to improve their quality of life and well-being by more than 80% (12 items or more).	4	12 (4*3)
The local community was encouraged to improve their quality of life and well-being by at least 51%-80% (11-8 items).	3	9 (3*3)
The local community was encouraged to improve their quality of life and well-being by at least 21%-50% (7-4 items).	2	6 (2*3)
The local community was encouraged to improve their quality of life and well-being by less than or equal to 20% (0-3 items).	1	3 (1*3)

### 3.2.1.5 Community participation factors in mining management (weight value = 4)

This factor concerned the public participation in ceramic mining management and the impact of the mining operations. The processes of informing about the project details and expected impact before conducting the various mining-related activities were addressed. The criteria for determining community participation in mining management were developed from the checklist on the above issues and calculated from 10 questions as the number of items that "have"/10 \* 100. The ratios of the scores are shown in Table 6.

**Table 6:** Criterion of Community Participation in Mining Management

Criterion	Score	Points (Score * Weight Value)
More than 80% of the people in the community participated in the mining management (9 items or more).	4	16 (4*4)
Between 51% and 80% of the people in the community participated in the mining management (6-8 items).	3	12 (3*4)
Between 21% and 50% of the people in the community participated in the mining management (5-3 items)	2	8 (2*4)
Less than 21% of the people in the community participated in the mining management (0-2 items).	1	4 (1*4)

### 3.2.2 Factors and criteria used for areas not previously mined

Only one factor, which was community participation in mining management, was used to assess the social context and public participation in ceramic mining. The weighting values were determined, as shown in Table 7.

**Table 7:** Weight Factors for Areas Not Previously Mined

Factors for Areas Not Previously Mined	Weight Value
Community participation in mining	15
<b>Total</b>	<b>15</b>

Only one factor was considered for areas not previously mined following the process of participation under Office of the Council of State (2017). Informational announcements were made concerning the details and expected impacts of mining in the area before conducting the mining-related activities and surveying the people for their opinions. This was followed by arranging a public hearing to allow people to join a working group to conduct a referendum on various issues. These activities reduced the conflicts in the area. Criteria for determining community participation in mining management were developed using the checklist on the above issues. An assessment was based on a score of 10 questions that was calculated as the number of items that "have"/10 \* 100 (Table 8).

**Table 8:** Criterion of Community Participation in Mining

Criterion	Score	Points (Score * Weight Value)
More than 80% of the local community participated in the mining activities (9 items or more).	4	60 (4*15)
Between 51% and 80% of the local community participated in the mining activities (6-8 items).	3	45 (3*15)
Between 21% and 50% of the local community participated in the mining activities (5-3 items).	2	30 (2*15)
Less than 21% of the local community participated in the mining activities (0-2 items).	1	15 (1*15)

The weight and scores of each subdimension of the social sciences were taken into consideration for further mining in the area together with other dimensions; such as, geological factors, the appropriateness of the mining technology, status, and economic, environmental and health factors following the guidelines of the Thailand Mineral Framework Classification (TMFC) (Department of Mineral Resources, 2019).

Five factors were considered as follows: 1) Generating income for the community, 2) increasing employment in the area, 3) development of labor skills, 4) increased quality of life for the local people, and 5) community participation in mining management. Only one factor was considered for areas not previously mined, which was community participation in mining management. This factor was not relevant regarding the criteria of the TMFC in the social science dimension. Only one factor was used to classify the mineral resources in the TMFC criteria that was the proportion of local labor migration, and this did not cover the social context. Social factors to address all aspects, including the social impacts and public participation were the main issues in mineral management. The results concurred with Mancini and Sala (2018) regarding the framework of the social impact in the mining sector, and with Wattanachaiyingcharoen (2010) concerning the concept of the assessment of the social impact at the community level.

### 3.3 Guidelines for mining management in the social science dimension of industrial ceramic materials

From the focus group discussions and a survey of the local community, management guidelines for two types of industrial ceramic materials (feldspar and kaolin) in the dimension of the social sciences were presented as follows:

#### 3.3.1 Management guidelines for mining operation areas

- 1) Promoted employment in the mining area and developed local labor skills related to mining operations.
- 2) Prepared measures of occupational health and safety management for workers in mining operations.
- 3) Promoted public participation in areas of mining operations; such as, building a good relationship between the owner of the mining project and the local community through various activities, and creating harmony within the community by establishing a public relations fund.
- 4) Collaborated with partners in all sectors including government agencies, the private sector, and other related parties to manage the social impacts resulting from the mining operations by promoting and preventing adverse effects on the quality and ways of life and supporting mechanisms to manage the social impacts holistically.

#### 3.3.2 Management guidelines for areas not previously mined

Built public participation by:

- 1) Classifying stakeholder groups.
- 2) Providing information about mining operations to increase formal understanding.
- 3) Studying the models, methods, procedures, indicators, public relations, problem-solving, and participation through public consultation.
- 4) Conducting public hearings regarding mining operations to manage any social impacts that could occur.
- 5) Collaborating with the stakeholders regarding decisions, and encouraging participation in monitoring the social impacts and other dimensions resulting from the mining operations to create social acceptance.

## 4. CONCLUSIONS AND RECOMMENDATIONS

### 4.1 Summary of the findings

From the study results of the social impacts of mining management, this indicated that the people residing nearby the feldspar mining area in Tak Province perceived and were positively impacted by the mining operations, such as being employed and receiving regular income. Moreover, there was a process of public



participation from the coordination, awareness building, mining operations, and preventive measures to correct various impacts. In the kaolin mining area in Lampang Province and from the diversity of the types of mines in the area, the people could not clearly identify the social impacts resulting from the kaolin mining operations. It was also found that the impacts of transporting kaolin and other minerals caused road damage, as well as the lack of responsibility or ignorance of preventive measures resulted in the existence of unresolved problems. Although all sectors and local community leaders had tried to resolve the social problems and impacts in different ways, these problems could still not be resolved at all levels.

From the study and consideration of the potential mining area for the two types of ceramic industrial minerals (feldspar and kaolin), the factors used to assess the social context of the social impacts caused by the mining operations were taken into consideration. The areas where mining operations had been previously carried out were assessed for generating income for the community, the proportion of local employment from the ceramic mining business, the development of labor skills related to ceramic mining, the quality of life of the people in the area, and community participation in mining management. For the areas where mining operations had not been previously performed, the factor of community participation in mining management was used in determining the suitability for the usage as a potential area onwards.

## **4.2 Recommendations**

### **4.2.1 Policy recommendations**

1) The government sector should have measures and guidelines to promote education in mining, as well as about the environmental, health and social impacts through the cooperation of various agencies. Initially, educational agencies; namely, the Ministry of Education and educational institutions, should develop a curriculum that would promote public participation to raise awareness and promote attentiveness of the local people to be enthusiastic about being involved in several issues that would have an impact on their life and society. After that, the operations should be conducted mutually with the Department of Mineral Resources, Department of Primary Industries and Mines, and local government organizations in order to prepare a curriculum for public participation in mining business operations or knowledge about mining operations, so that people could be aware of both the positive and negative impacts that would be caused by mining operations and be able to participate in mining management in their areas.

2) The government sector should give increasing precedence to the SIA, as nowadays, social impacts are often brought under the study of the Environmental Impact Assessment (EIA). As a result, the substance or issue of the social impacts has been ignored or repealed. Therefore, the government sector has to assign different mines; namely, ceramic industrial minerals, construction or electricity generation, to give great importance to the study of the social impacts in the aspects of income, employment and education, demography, and/or human rights. These issues could not be studied under the EIA or Health Impact Assessment (HIA). Therefore, the government sector should determine the legal provisions or measures for the SIA in the mining industry clearly and concretely.

### **4.2.2 Operational recommendations**

1) For strengthening public participation, the local community, government agencies, entrepreneurs, and stakeholders are considered as one of the important and effective mechanisms in mineral management of the ceramic industry. This would create acceptance in the community by jointly managing the various impacts, as well as finding ways to prevent and resolve the impacts of the integrated mining operations by determining the various principles for local administrative organizations and communities to be more involved in the management; such as, public relations, mass relations planning, arranging meetings to listen to opinions and brainstorming ideas on solving problems within the community, etc. There should also be the promoting of the cooperation with various network partners in the management to enhance continuity and efficiency of the participatory process.

2) Promoting local employment, improving labor skills and the welfare of the workers by mining entrepreneurs must be given more attention for hiring people in the area and determining a suitable proportion of the labor. In addition to generating income, this would also be considered a process of public relations, creating understanding of the mining operations for the people in the area, and creating a sense of mutual ownership. Moreover, emphasis must be given on developing labor skills and preparation of the measures, occupational health management and safety, and management for the workers to operate in the mining business effectively. This would be because working in mines would carry a high risk of injury or loss.

### **4.2.3 Recommendations for ceramic industrial minerals**

1) Consideration should be given to the determination of the policy for the expansion of potential areas for ceramic industrial minerals, which the criteria used for classifying potential areas should be developed by collecting information of the patent permits, types and amounts of the minerals, value of the raw minerals, and

spatial restrictions (environmental protection and pollution control zones, urban planning areas, water sources, and absorbent forests without clear information and definition). All the information should be systematically collected from the same source. Furthermore, the database should be kept up to date in order to be taken into account with other factors to formulate the policies and guidelines for further implementation.

2) Encourage related agencies to jointly develop systems and mechanisms to be more efficient; such as, a one-stop service by coordinating with the various related agencies to facilitate the operations for establishing the development of operational efficiency; such as, requesting a new patent permit, renewing patent permits, requesting information about geology, the economy, environment and social sciences, as a result of the difficulty and time consumption of the process of requesting for a patent permit.

3) There should be promotion and support for the use of modern technologies for ceramic mineral production; such as, digging, drilling, exploding, or digesting minerals to the right sizes and continuous industrial development from minerals with comprehensive processes, including a gristmill and ore dressing mill, which have various activities; such as, mineral washing, mineral sorting, mineral milling, ore dressing, etc. All these activities require various technologies to produce ceramic minerals to have more quality and be more beautiful.

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