

STUDY OF SOCIO-ECONOMIC AND ENVIRONMENT IMPACTS OF INCONVENTIONAL TIN MINING (A CASE STUDY: BANGKA BARAT DISTRICT OF BANGKA BELITUNG PROVINCE)

Fahrika Erwana¹, Kania Dewi² and Benno Rahardyan³

^{1,2,3}Program Magister Teknik Lingkungan, Institut Teknologi Bandung

Jl. Ganesha 10 Bandung 40132

Email : fahrika.erwana59@gmail.com¹, kaniadewi@ftsl.ac.id²andbenno@ftsl.itb.ac.id³

Abstract: This study is a measurement and evaluation of the impact of unconventional tin mining on the social and economic conditions, as well as the environmental damage caused by tin mining in the district of West Bangka of Bangka Belitung province. Data were obtained from questionnaires, observation, and literature review. Firstly, questionnaire need to be tested its validity and reliability before continued to assess awareness and perception. In addition there will be path analysis to observe the influence of variables to perception of social, economic and environment impacts. The study involved 400 randomly selected respondents in the two sub districts in the District of West Bangka, they are Mentokand Jebus. Observation result showed that the unconventional tin mining gives negative impact on the environment and social conditions, but it gives a positive impact on the economic conditions. Based on path analysis, variables of awareness, participation, expectation and support unconventional tin mining have significant effect to perception of social, economic and environment impacts.

Keywords: Unconventional tin mining, validity, reliability, path analysis

INTRODUCTION

Bangka Island is largest tin producer in Indonesia. From Bangka island area 1.29405 million ha, amount 27.56% of the island's land area is a Tin Mining Authorization. PT. Tambang Timah (a subsidiary of PT. Timah Tbk) control land area of 321 577 ha and PT. Kobatin 35 063 ha (Bappeda Bangka 2000). Beside the two companies, Tin Mining Authorization also be given to private companies. Until mid-2007, the number reached 101 .(Dinas Pertambangan Provinsi Kepulauan Bangka Belitung 2007).

In addition there are a number of other private smelters and traditional miners called unconventional mining (TI) which mines spread over land and sea of Babel. Tin mining issues began to emerge since the number of IT is increasing every year.

Mining activities throughout the world, have contributed both positively and negatively on the economic and social aspects of the communities in the mining areas. Visible positive contribution in the form of increased income, employment increase, intense migration and population growth and the provision and maintenance of social facilities. But besides a positive contribution, mining also includes the negative impact of land degradation, increasing levels of crime, the loss of agricultural land and cultural heritage, health hazards and inflation. (Onwuka, et al., 2013).

The studies about the impacts of mining activities on the environment and social and economic community have been done by Kitula (2004), Petkova (2009), Samuel et al (2012), Ocholla et al (2013), Onwuka, et al (2013), Sati (2014). But until now the method of the study is still growing. Some studies are very specific to certain types of mining materials and a location

on a geographic scale. Only a few studies have used statistical analysis in the study.

The purpose of this study was to determine the awareness of the public about the environmental impact of tin mining in Bangka Barat. In addition, this study also aims to determine the public perception of the impact of social and environmental economic society due to unconventional tin mining in Bangka Barat.

This study is based on the hypothesis that the mining activities have a significant impact on the socio-economic and environmental. (Kitula, 2005).

This study reviews both negative and positive impacts of unconventional tin mining. Policies and strategies for the management of post-mining region should sustainability three main dimensions of ecology, economic and social. It is necessary to study the impact of research on unconventional tin mining on the environment and socio-economic communities in West Bangka.

METHODOLOGY

In this study describes the data that has been obtained from the questionnaire, observation, interview and literature study.

The variables of this study are:

- a. The variable impact on the physical and chemical properties of the environment.
 - 1) Environmental degradation (damage) as a result of tin mining open pit methods.
 - 2) Environmental pollution due to mining activities.
- b. The variable impact on the social and economic conditions
 - 1) Public awareness of the environmental impacts.
 - 2) Public perception of the social, economic and environmental consequences of tin mining activities.
 - 3) The willingness of the public to participate in environmental management as a result of unconventional mining.
 - 4) Expectations for unconventional mining community.

Data collection is obtained by questionnaires, observations and literature study.

Stages of data analysis consists of:

Test Validity and Reliability Questionnaire

Validity and reliability test aims to determine whether the questionnaires valid and accurate to measure the public's awareness and perception. Validity analysis using item-total correlation formula. Item statement or question declared invalid if it has a coefficient of r count larger than the standard r coefficient (can be obtained from table r). r value standard in This study involves 400 respondents with a significance level of 5%. If r correlation value is greater than the table, the questionnaire can be said to be valid.

To test the reliability coefficient it is obtained or $r_{\text{calculation}}$ consulted with r_{table} in the significant level of 5%. The test results said to be reliable if $r_{\text{calculation}} > r_{\text{table}}$ and otherwise said to be reliable if $r_{\text{calculation}} < r_{\text{table}}$

Data Analysis to determine the public awareness against environmental impacts and the

public perception of the impact of mining activities on the social and economic conditions and the environment were analyzed quantitatively by scoring method (Dedek Apriyanto, 2012). Awareness assessment carried out with weights with a Likert scale, such as Strongly Disagree (STS) = 1, Disagree (TS) = 2, Neutral (N) = 3, Agree (S) = 4, and 5 = Strongly Agree.

Path Analysis

Path analysis is a way to study direct and indirect effects number of variables that are hypothesized as a cause variable to result variable.

Discriminant Analysis

Discriminant analysis is a statistical analysis technique which has uses to classify the object of several groups. Grouping with discriminant analysis is the case because there is the influence of one or more other variables that are independent variables. Linear combination of these variables will establish a discriminant function (Tatham et. al.,1998).

RESULT AND DISCUSSION

Research samples were taken from is two districts namely: Mentok and Jebus and the community who are randomly selected. **Figure 1** presents the distribution of respondents in the Mentok and Jebus.

Figure 1. Respondents Distribution Map

Inconventional Tin Mining Impacts on the Environment

In this study, public awareness of the environmental impact has two questions, namely the question of pollution (Q1), damage (Q2). Distribution of consciousness or awareness of the environmental impact can be seen in **Figure 2**.

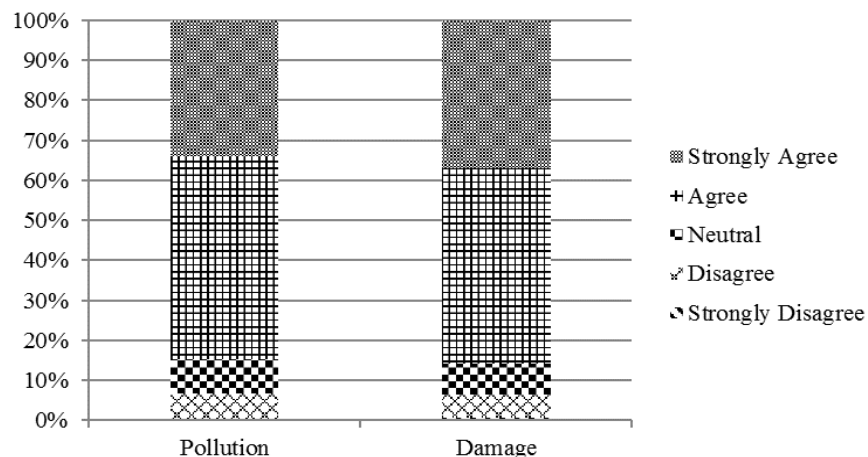


Figure 2. Awareness of the environmental impacts

Based on Likert scoring, the percentage of awareness of the environmental impact in the form of pollution is 82% and the damage is 83%. So that public awareness of the environmental impact is very high.

Results of a survey on public perception of the environmental impact has 8 questions, namely the question of water pollution (Q13), soil contamination (Q14), air pollution (Q15), changes in the landscape (Q16), noise nuisance (Q17), health problems (Q18) and comfort disruption (Q19) can be seen in **Figure 3**.

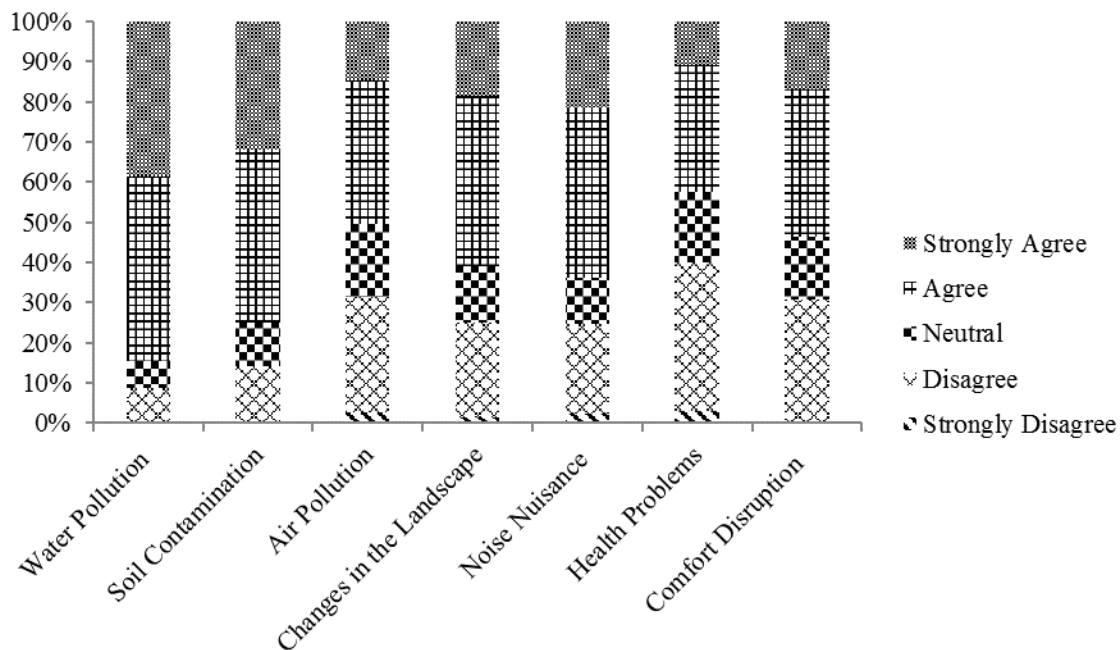


Figure 3. Perception of The Environmental Impacts

Based on Likert scoring, the percentage of perceptions of environmental impacts such as water pollution, soil pollution, air pollution, landscape change, increased noise, health problems and comfort disruption each by 83%, 78%, 66%, 71% , 72%, 62% and 68%. It means the public perception of the environmental impact is negative.

Inconventional Tin Mining Impacts on Socio-Economic Conditions

a. Perceptions of Social Impact

Public perception of the social impacts has five questions they are presence of immigrants (Q3), conflict (Q4), the level of crime (Q5), social jealousy (Q6), and changes in social conditions (Q7). Distribution of public perceptions of the social impacts can be seen in **Figure 4**.

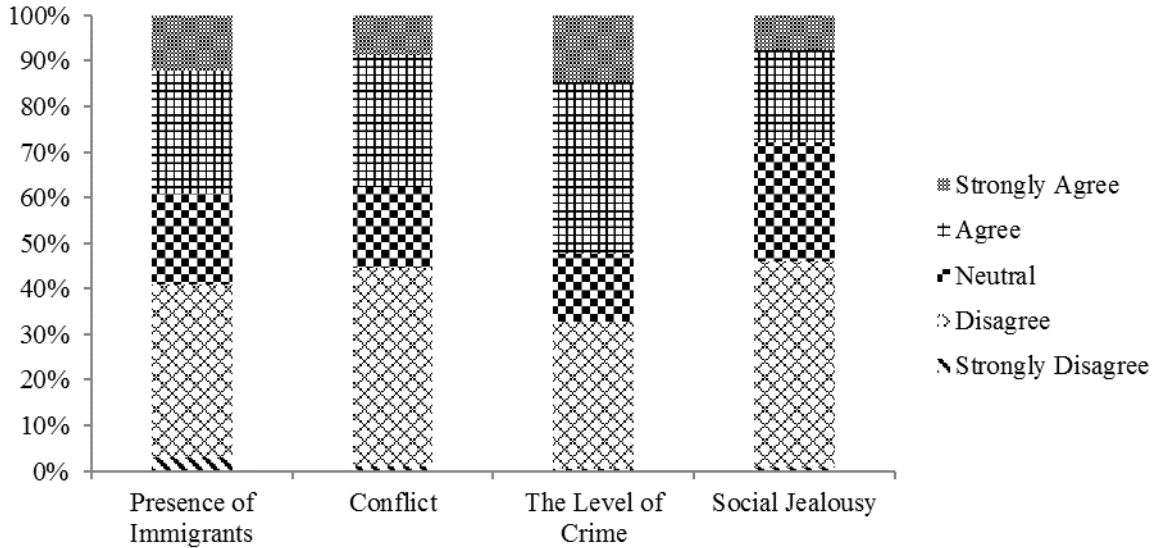


Figure 4. Perception of The Social Impacts

Based on Likert scoring, the percentage of the perception of social impact in the form of the presence of migrants, conflicts, increased crime rates and social jealousy, respectively 61%, 60%, 67% and 58%. It means the public perception of the social impact of such conflicts and jealousy categorized neutral. While the public perception of the social impact in the form of the presence of immigrants and the increase in crime rate negative categorized.

b. Perceptions of Economic Impacts

Public perception of the economic impact has five attributes questions that income increase in (Q8), job opportunities (Q9), business opportunities (Q10), land compensation (Q11), and changes in economic conditions (Q12). Distribution of public perceptions of the social impact of this can be seen in **Figure 5**.

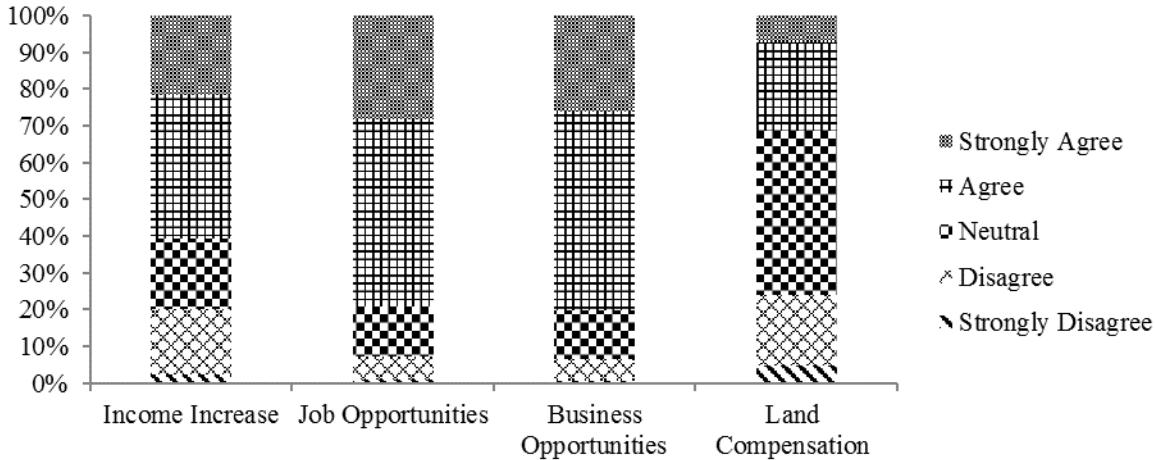


Figure 5. Perception of The Economic Impacts

Based on Likert scoring, the percentage of the perception of the economic impact of increased income, employment, business opportunities and land compensation, respectively 72%, 80%, 80% and 62%. It means the public perception of social impact is positive.

Willingness to Participate in Managing Environment Impacts of Unconventional Tin Mining

Composition of the public's willingness to participate in managing environment impacts of un conventional tin mining can be seen in **Figure 6**.



Figure 6. Willingness To Participate In In Managing Environment Impacts Of Unconventional Tin Mining

If expectation compared to willingness to participate, those who are dissatisfied with the unconventional mining, are not willing to participate in environmental management. It means people are not willing to participate in environmental management because in conventional tin mining didn't meet their expectations. **Figure 7**. shows the relationship both aspects.

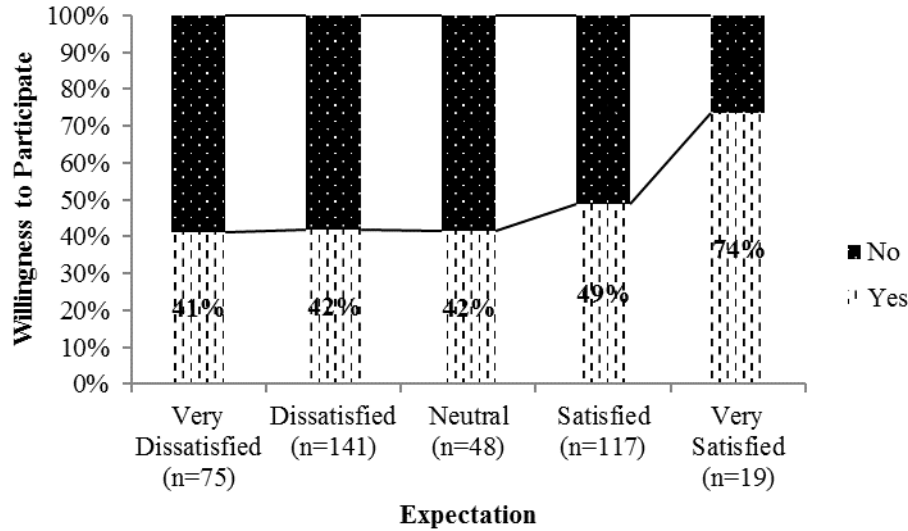


Figure 7. Expectations Willingness To Participate

Supporting for The Existance of Inconventional Tin Mining

People support for the inconventional tin mining can be seen at **Figure 8**.



Figure 8. People Support For Inconventional Tin Mining

Base on the **Figure 8**, can be seen that some respondents (53%) are not supporting inconventional tin mining.

If we compared between respondent support for inconventional mining and environment pollution awareness, those who have awareness of environment impacts not supporting inconventional tin mining that cause environment pollution (**Figure 9**).

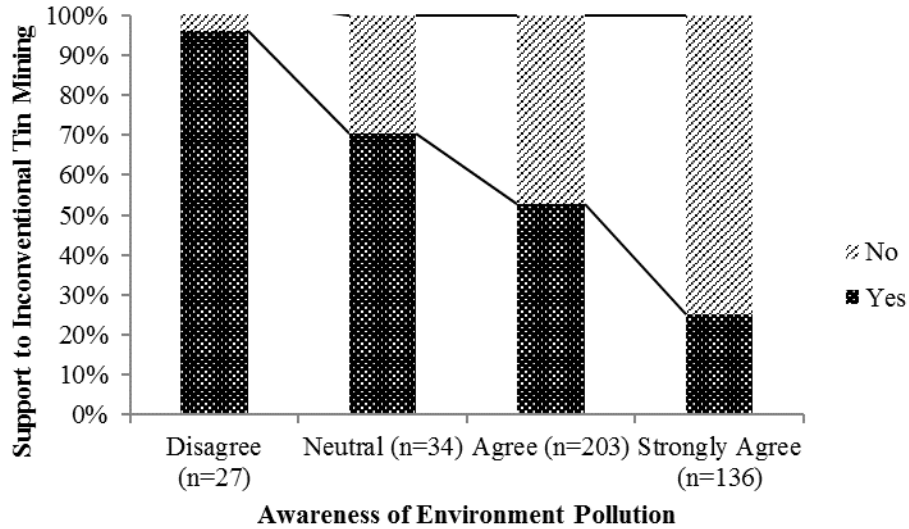


Figure 9. Awareness Inconventional Tin Mining Support

While if we make comparison between inconventional tin mining support and willingness to participate, those who are not supporting inconventional tin mining, are not willing to participate (Figure 10).

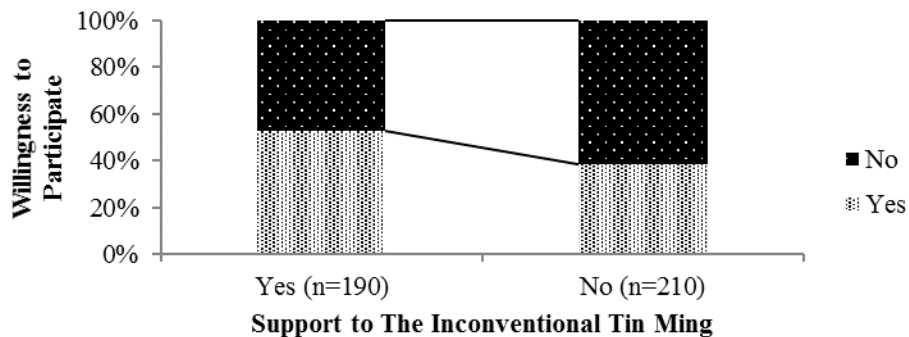


Figure10. Supporting for inconventional tin mining vs willingness to participate

Comparison between inconventional tin mining support and expectation is shown in Figure 11. Those who are not supporting inconventional tin mining said that they are not satisfied.

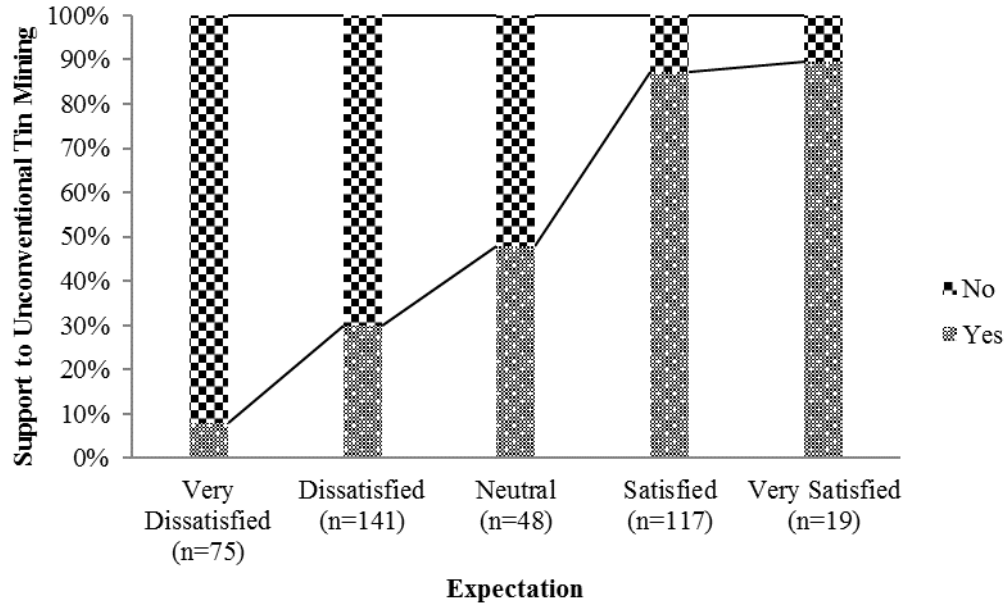


Figure11. Expectations Supporting For Inconventional Tin Mining

So, supporting for inconventional tin mining is influence by aspects of awareness, willingness to participate and expectation.

Awareness and Perception Based on Area

Survey shows that 14 out of 18 villages surveyed have very high awareness, 3 out of 18 villages are high categorized and 1 village is middle categorized. The composition of people awareness in each village shown in **Figure 12**.

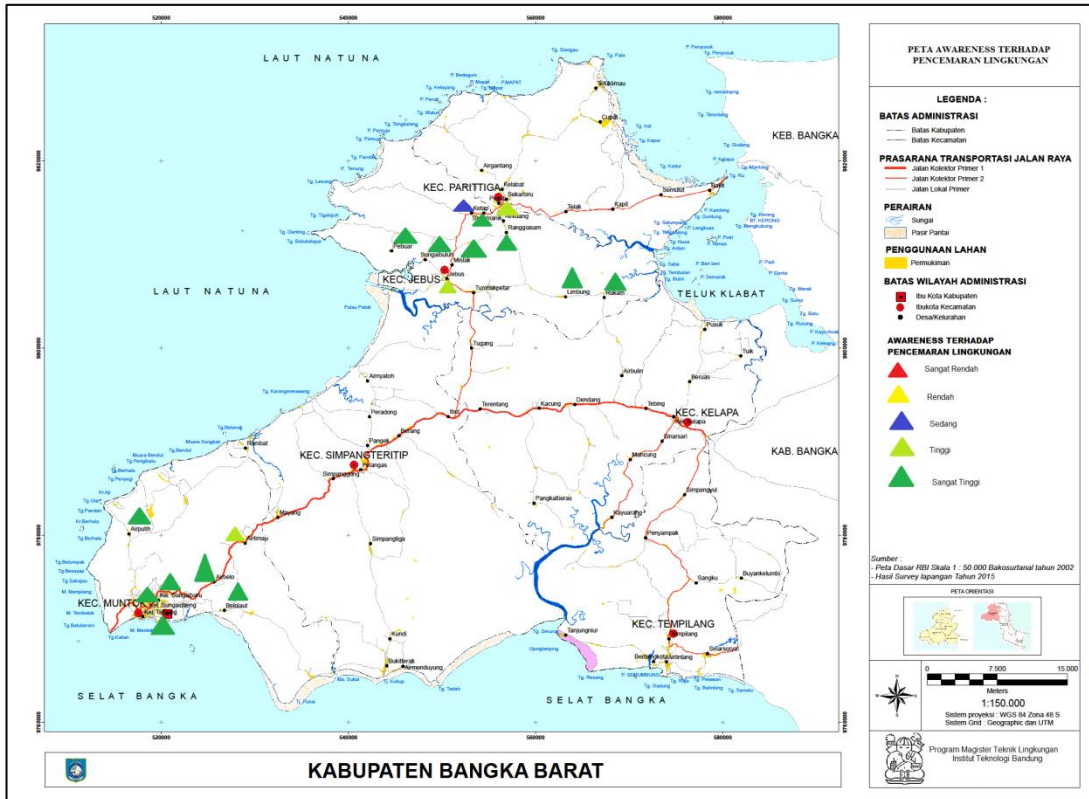


Figure12. Awareness Mapping Based On Area

While composition of social, economic and environment perception shown in **Figure 13.**

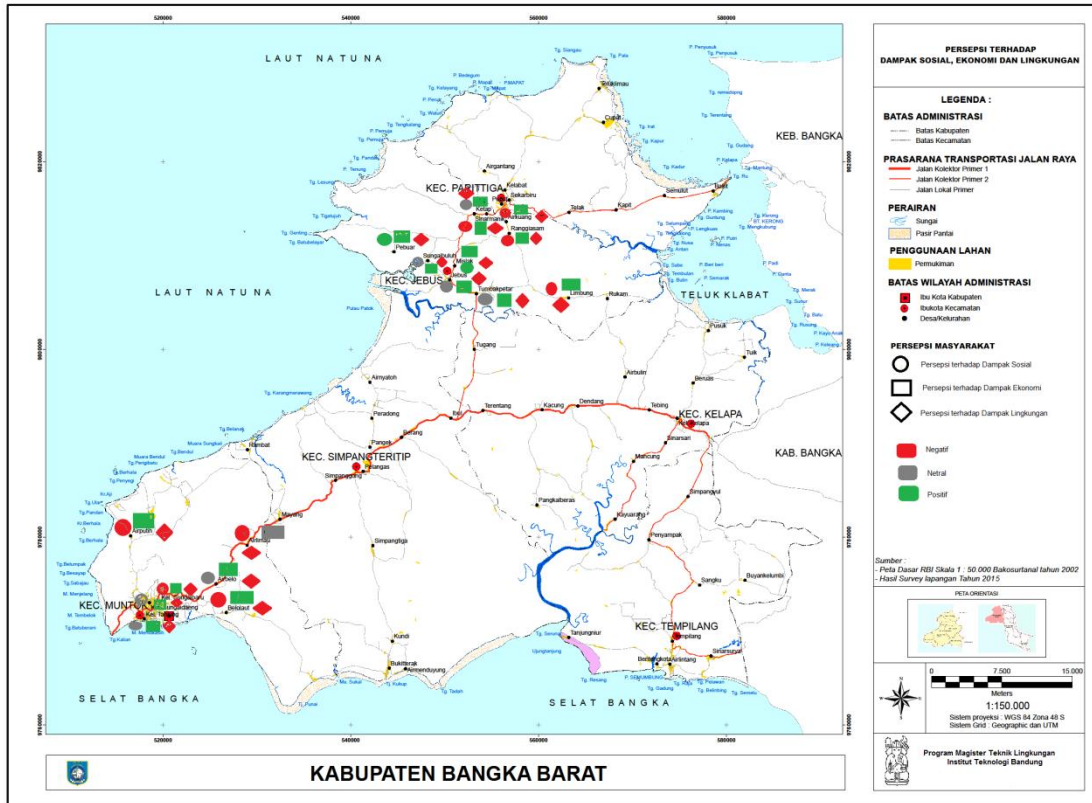


Figure 13. Perception Mapping Based On Area

If we make comparison between perception and existing environment condition, those who live in middle condition are neutral to the social impact. And those who live in bad environment condition have negative perception of social impact due to unconventional tin mining. For the social impacts, both communities live in very bad, bad and middle environment conditions have positive perception of economic impacts. And both communities live in very bad, bad and middle environment conditions have negative perception of environmental impacts due to unconventional tin mining.

Cluster Analysis

This study used K-means method to make 2 segment groups based on supporting for unconventional tin mining.

In cluster 1, there are 184 respondents who live in bad environment condition, have very high awareness of environment impacts, negative perception of environment impacts, neutral to the social impacts, positive perception of economic impacts, not willing to participate, satisfied and supporting to the unconventional tin mining.

In cluster 2, there are 216 respondents who live in bad environment condition, have high awareness of environment impacts, negative perception of environment and impacts, positive

perception of economic impacts, willing to participate, dissatisfied and not supporting to the unconventional tin mining.

Based on respondents' attribute, cluster classifying shown in **Figure 14**.

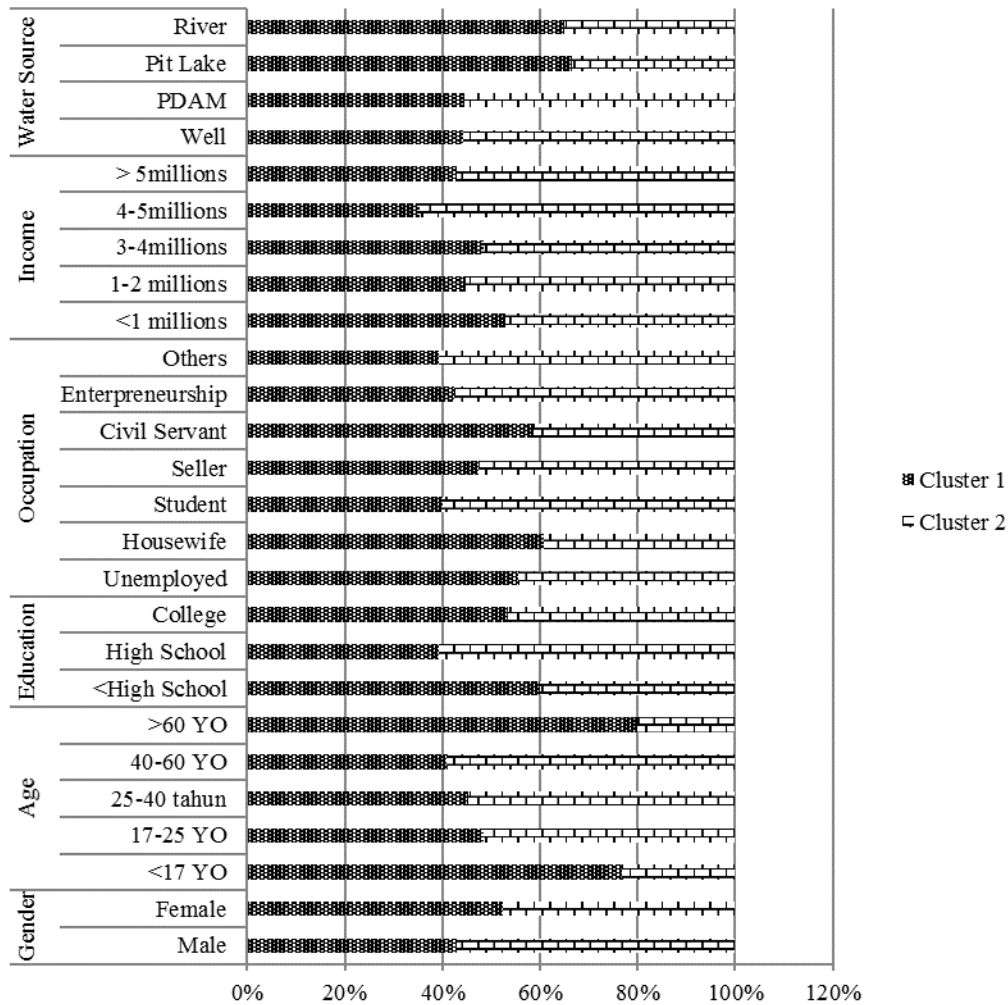


Figure 14. Cluster classifying based on respondents' attribute

Based on crosstabs analysis in **Figure 14**, respondents' characteristic in cluster 1 is dominated by women who are above 60 years old whose education below high school, as housewife with income below 1 millions and used pit lake (kolong) as water source.

Respondents' characteristic in cluster 2 is dominated by men who are 40 – 60 years old whose education high school. They are dominated by people beside civil servants, entrepreneur, housewife, and student. And they used water from PDAM and well.

Discriminant Analysis

All variables, except perception of environment impacts have role in classifying respondents. Discriminant analysis result in each cluster produces the variable as **Table 1**.

Table 1. Standardized Canonical Discriminant Function Coefficients

Variables	Function 1
Environment Condition	0.006
Perceptions of Social Impacts	0.247
Perceptions of Economic Impacts	0.031
Willingness to Participate	-0.135
Expectation	0.966

By using canonical discriminant function coefficient in **Table 1**, can be made discriminant function as follow:

$$D = 0,006X_1 + 0,247X_2 + 0,031X_3 - 0,135X_4 + 0,966X_5 \quad (\text{I})$$

Discriminant classification result is shown in **Table 2**.

Table 2. Classification result

		Supporting for Inconventional Tin Mining	Predicted Group Membership		Total
			Yes	No	
Original	Count	Yes	140	50	190
		No	35	175	210
	%	Yes	73.7	26.3	100.0
		No	16.7	83.3	100.0

a. 78.8% of original grouped cases correctly classified.

So, based on discriminant analysis, variabels of social perception and expectation discriminate respondents' behavior in deciding supporting for unconventional tin mining with 78.8% of original grouped cases correctly classified.

CONCLUSION

The study showed that unconventional tin mining gives negative impacts on the environment and social condition, but it gives positive impacts on the economic condition. Based on cluster analysis, there are 2 clusters, they are cluster 1 (negative) and Cluster 2 (positive). Cluster 1 is dominated by women who are above 60 years old whose education below high school, as housewife with income below 1 millions and used pit lake as water source. Cluster 2 is dominated by men who are 40 – 60 years old whose education high school. They are dominated by people beside civil servants, entrepreneur, housewife, and student. And they used water from PDAM and well.



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