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Research Article

The Consequences of Illegal Mining in the Environment: Perspectives Behavioral, Knowledge and Attitude

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Abstract: Environmental problems can overcome by changing the mental attitude of humans as environmental destroyers to humans who are aware of their environment. The focus in research is to find out and then interpret the results obtained related to the presence or absence of influence between the level of knowledge and attitudes of traditional miners on behavior. The number of samples used was 212 respondents spread over traditional mining areas of the community. Data is obtained from surveys using questionnaire instruments and interviews with traditional miners. The data is then analyzed Structural Equation Model (SEM) using IBM AMOS 23. The results of validation and reliability and goodness of fit (GOF) indicate that the model is feasible and fit. The results of the analysis show that there is a significant impact between the variables of knowledge and attitudes towards the behavior of the mining community. The condition of enough knowledge is not able to change people's behavior to manage the environment. The results obtained are the same as attitudinal variables that show contra to the environment. All ways are done to get profits without seeing the consequences. The attitude of the government must be more assertive in controlling illegal mining that has damaged the surrounding environment. Humans who are aware of their environment are humans who already understand and apply attitudes and behaviors that care about the environment and apply the principles of ecology and environmental ethics.

Keywords: Activities Sustainably, Lawrence Green's Theory, Structural Equation Model (SEM), Traditional Gold Miners.

1. Introduction

Mining activities in addition to bringing in foreign exchange and absorbing employment are also prone to environmental destruction [1]. Many mining activities invite the spotlight of the surrounding community due to environmental destruction, moreover the mining of gold without permits which besides damaging the environment also endangers the lives of miners due to the limited knowledge of the miners and due to the absence of supervision from the relevant agencies [2].

Mining is an industry that processes natural resources by processing mining materials to produce a variety of end products needed by humankind [3]. Therefore, mining material is one of the icons that is needed by the world today, where the development of the age of mining materials is the number one natural wealth in Indonesia and even the world.

Traditional mining activities, especially mining in Bombana Regency, made great news when it discovered a huge gold deposit on the Tahite River, located not too far from the district capital about 30 km from the capital of Bombana Regency, Southeast Sulawesi Province [4]. The discovery of this mine in the form of gold mining results to make people around the location become more excited again to mining. Without the need to do a lot of socialization because information discovery of gold circulated quickly through word of mouth and through the mass media [5]. So, the impact of the news is very large and quickly spread to the gold miners of the people who are from all parts of Indonesia in general, especially for people who are in Eastern Indonesia, especially Papua, Southeast Sulawesi and East Kalimantan.

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There has been environmental degradation since the discovery of gold in Bombana Regency, another emerging impact is the rapidly changing socio-cultural and economic consequences of this gold discovery, the people who used to work with long process patterns to get the results, turned into a process with an instant pattern. In fact, many residents leave their profession from farmers, farmers, fishermen, garden workers and even traders shift profession to miners [6]. Changes in social behavior of society is very disturbing if not organized early.

The impact of these sporadic activities resulted in the creation of a separate social community within the miners' environment as well as the exploitative behavior of natural resources from traditional miners [7]. The next cause, another because there is no guidance to the community about how the mine management well so slowly changes the pattern of behavior of people's lives are only concerned with the mere matter with no care for the surrounding environment. The immediate impact of all this has significantly changed the attitudes and behaviors, and lifestyles of traditional gold miners, who once lived and worked by relying on processes such as farming, livestock, trade, and others carried out safely and peacefully and prosperously, gradually but surely change to an instant lifestyle [8]. The impact of this social change resulted in the decline of quality of life and the destruction of the surrounding environment due to cultivating land that is not by the designation and the absence of reclamation efforts so that the area can use for other purposes [9].

US-EPA [10], has conducted a study of the effect of mining activities on environmental damage and human health in 66 mining activities. The results of the study show that pollution of surface water and groundwater is an environmental impact that often occurs due to these activities.

Based on a preliminary survey of researchers, conditions on the ground show that despite the high economic impact of extensive exploration conducted by communities and mining companies. But there are also significant adverse environmental impacts occurring at the mine site such as soil erosion and waterlogging, as well as the disposal of wastewater, solid waste, hazardous wastes and others causing environmental degradation at the mine site [11]. To overcome this problem in order not to have any further impact, it should be anticipated earlier by local government and all elements related to the mining and environmental sectors to avoid greater losses that could occur, such as the decrease in ecological carrying capacity and environmental damage around the mine site [12].

The main problems that arise in the open and controlled community of traditional gold mining management are the attitudes, knowledge, and behavior to preserve the environment that is environmentally sound so that the climate becomes vulnerable due to uncontrolled exploitation and becomes the focus to sustain traditional mining activities sustainably. Another problem is that the community does not understand how to behave and behave well to preserve the surrounding environment. No encouragement or example can increase miners' motivation in understanding the problems surrounding climate. Another problem is the occurrence of social insecurity in the form of acts of violence and human rights violations due to low public awareness about the surrounding environment and a decrease in the safety and quality of public health of traditional gold miners. The last problem is about the welfare of miners, namely the emergence of a very noticeable income gap between the traditional gold mining community with the middlemen and the business owners of mining companies [13]. Even so, the current conditions at the mine site are already under the control of the local government by applying management rules to licensed mining companies.

2. Research Methods

2.1. Respondent

The research respondents data used were 212 respondents according to recommendations [14], that for SEM analysis 100-200 samples were used. The method of data collection in this study uses a questionnaire, namely some written questions that are used to obtain data from respondents in the form of profile data and critical issues concerning the themes and problems studied [15]. The demographics of the samples used in the study can be seen in Table 1 as follows:

Table 1. Demographics Profile of Respondents

No.	Category	Freq.	Percent. (%)
1	Gender		
	Man	155	73.11%
	Women	57	26.89%
2	Education		
	No School	12	5.66%
	Primary School	97	45.75%
	Junior High School	81	38.21%
	Senior High School	22	10.38%
3	Age		
	20 – 30 years	27	12.74%
	31 – 40 years	76	35.85%
	41 – 50 years	85	40.09%
	51 – 60 years	24	11.32%
4	Income/week		
	Below IDR 1.000.000	14	6.60%
	IDR 1.000.000 - IDR 2.000.000	93	43.87%
	IDR 2.000.000 - IDR 3.000.000	89	41.98%
	Above IDR 3.000.000	16	7.55%
5	Previous Job		
	Unemployment	32	15.09%
	Farmers, and Fishermen	48	22.64%
	Daily labor	54	25.47%

No.	Category	Freq.	Percent. (%)
	Traditional Miners	78	36.79%

USD 1 = IDR 14.000

Table 1 shows that gender dominated by men who constitute the majority as head of female household respondents only as helping and others as wives. The highest level of education of respondents is at the elementary school level with more experience in traditional mining processing; miners are generally migrants from outside the area whose primary purpose is only to become miners then will return home when finished. The age of most respondents ranged from 41-50 years later 31-40 years which at that age is a productive age of someone in achieving income. Earnings in a week that obtained from the biggest miners range from IDR 1 Million - 2 Million Rupiah which is the result of mining in general and can be much higher if in using the tools and new substances. Then the last is the previous work, many respondents are miners or have experience as miners because being miners, especially traditional miners must first have experience with being miners.

2.2. Location Study

Bombana Regency is in the South-East Peninsula, Sulawesi Island is geographically located in the South of the equator, extending from North to South between 4° 30'-6° 25' South latitude and runs from West to East between 120° 82'-122° 20' East longitude. Bombana Regency has an area of land covering an area of 2,845.36 km^2 or ha 284,536 and territorial waters sea estimated 11,837.31 km^2.

Figure 1. Location Study in Bombana Regency, Southeast Sulawesi Province.

2.3. Data Analysis

To determine the questioned assessment, the Likert Scale assessment method used, namely that each question item classified as five (5) answer choices where the answer choice score strongly agrees, agrees, neutral, disagrees, strongly disagrees.

After calculating the results of the data processing questionnaire then the data entered will be analyzed and tested using the multivariate Structural Equation Model (SEM) technique of IBM AMOS 23. According to Bagozzi and Fornell [16], SEM is a second-generation multivariate analysis technique. Bollen [17], states that unlike ordinary multivariate analysis (multiple regression, factor analysis), SEM can test together namely:

1) The measurement model is the relationship (loading value) between the indicator and the construct (latent variable).
2) The structural model is the relationship between independent and dependent constructs.

2.4. Research Model

The research model based on Lawrence Green's theory states that three factors influence behavior or commonly called Precede (Predisposing, Reinforcing, Enabling Constructs.

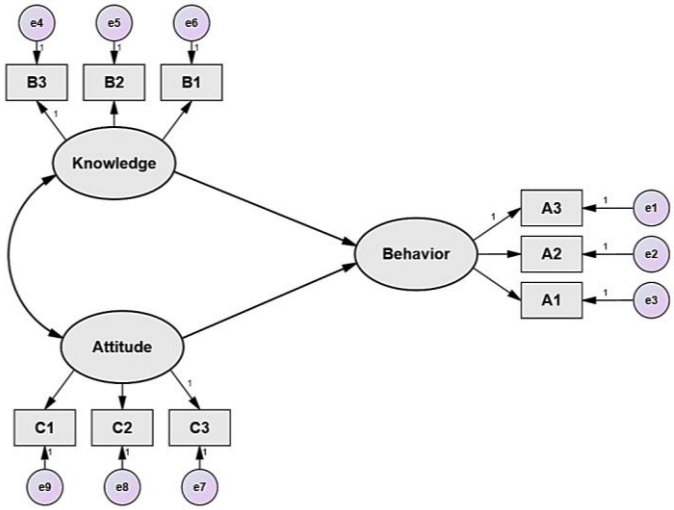

Figure 2. Predisposing Research Model by Lawrence Green's Theory.

This study analyzes one of these factors, namely factors predisposition which is a factor that includes the knowledge and attitudes of the community towards health, tradition and public trust in matters relating to health, the value system adopted by the community, education level, socio-economic level and so on [18].

Table 2. Explanation of Variables Construct the Research Model.

No.	Variable and Construct	
1	Behavior	
	Personal considerations (thoughts and feelings).	A1
	The existence of resources such as facilities, money, time, will affect people's behavior.	A2
	Culture, habits, and traditions that exist in society.	A3
2	Knowledge	
	Knowing is interpreted only as recall pre-existing memory after observing something.	B1
	Understanding an object is not just knowing about the object, not just being able to say but can interpret correctly.	B2
	Applications are interpreted if the person who has understood the object is intended to be able to use or apply the known principle.	B3
3	Attitude	
	The cognitive component, which is a belief and understanding individual on an object through a process of seeing, hear and feel. Trust and understanding formed to provide information and knowledge about the object.	C1
	The affective component, which is the component that is related to individual subjective emotional problems with something.	C2
	The conative component, namely tendency to behave an individual to the object he is facing.	C3

Skinner [19], formulated that behavior is the response or reaction of a person to external stimuli because this behavior occurs through the process of an organism.

Knowledge is a term used to say when someone knows something. A thing that becomes his knowledge always consists of elements that understand and are recognized and awareness of things that want to know [20].

Attitude is said to be a response that only arises when individuals faced with a stimulus. A person's attitude toward an object is a feeling of supporting or favoring or feeling of not helping or unfavorable to a particular purpose. Belief is a preparation to react to objects in a specific environment as an appreciation of objects [21].

3. Results and Discussions

3.1. Reliability and validity

A good measurement model must meet three criteria, namely (a) reliability; (b) convergent validity; and (c) discriminant validity [22].

Table 3. Validation and Reliability of Research Models

Variable	C.R	D.V	AVE
Knowledge	0.689	0.906	0.821
Attitude	0.703	0.913	0.833
Behavior	0.742	0.930	0.865

Proof of convergent validity can be achieved in two ways, first is the achievement of criteria and the second through a comparison test model. In the SEM/PLS approach, a measurement meets convergent validity if it fulfills several conditions [14]. The Construct Reliability (CR) value is > 0.70 and the Average Variance Extracted (AVE) value is > 0.50 [23].

Based on the results of the validation and reliability tests in Table 3 obtained values >0.500. This value is the recommended minimum value. Thus, it can be said that the indicators represent the latent constructs correctly developed.

3.2. Goodness of Fit (GOF)

A model (measurement model and structural model) is said to be fit or following the data if the sample covariance matrix is not different from the estimated population covariance matrix produced [24]. Then the statistical hypothesis for the model suitability test in SEM is formulated as follows:

- H_0: There is no difference between the sample covariance matrix and the population covariance matrix.
- H_1: There is a difference between the sample covariance matrix and the population covariance matrix.

The suitability test model is expected to accept the null hypothesis. In SEM the test was carried out using many measures of conformity (Goodness of Fit Test-GOF) as follows:

Table 4. Goodness of Fit (GOF) Test.

Parameter		Result
Absolute Fit Test	Chi-Square	0.642
	GFI	0.958
	RMSEA	0.002
Incremental Fit Measures	NFI	1.030
	CFI	1.022
	IFI	1.013
Parsimonious Fit Measures	PNFI	0.631
	PGFI	0.626

Table 4 shows the results of Goodness of Fit (GOF) Test. The explanation can see as follows:

1) Absolute Fit Test
   - Chi-Square is a measure of the maximum likelihood (ML) model suitability test. It expected that the value is low so that a high P-value (probability) that exceeds 0.05 obtained [25]–[27]. From the results of the analysis obtained the Chi-Square value of 0.642 with these results, it can conclude that the model is fit.
   - The goodness of Fit Index (GFI) is a descriptive measure of model suitability. The value is expected to be higher than 0.90 [25], [28], [29]. From the results of the analysis obtained the GFI value of

0.958 with these results, it can conclude that the model is fit.

- Root Mean Square Error of Approximation (RMSEA) is the approximate value of the average square root error. It expected that the low value is approximately equal to 0.08 [29]–[34]. From the results of the analysis, the RMSEA value is 0.002 with these results it can conclude that the model is fit.

2) Incremental Fit Measures
   - Normed Fit Index (NFI) is a measure of the suitability of the model on a comparative basis to the baseline or the null model. The null model is generally a model that states that between the variables contained in the estimated model are not interconnected. The value is expected to be higher than 0.90 [29], [35], [36]. From the results of the analysis, the NFI value is 1.030 with these results it can conclude that the model is fit.
   - Comparative Fit Index (CFI) is a comparative measure of the suitability of the model with the null model. The value is expected to be higher than 0.90 [34], [37], [38]. From the analysis results, the CFI value is 1.022 with these results it can conclude that the model is fit.
   - Incremental Fit Index (IFI) is a measure of comparative conformity proposed by Bollen [35]. The value is expected to be higher than 0.90. From the results of the analysis obtained the IFI value of 1.013 with these results, it can conclude that the model is fit.
3) Parsimonious Fit Measures
   - Parsimonious Normed Fit Index (PNFI) is a measure of parsimony conformity as a modification of NFI size. The value is expected to be higher than 0.50 [39], [40]. From the results of the analysis, the NFI value is 0.631 with these results it can conclude that the model is fit.
   - Parsimonious GFI (PGFI) is a measure of parsimony conformity as a correction from GFI. The value is expected to be higher than 0.50 [39], [41]. From the results of the analysis obtained the PGFI value of 0.626 with these results, it can conclude that the model is fit.

3.3. Loading Factor

The loading value shows the relationship between the research variable and the construct (indicator). Then a useful construct (indicator) on a variable is a construct that has the most considerable loading value because it shows a relationship between indicators and high research variables. In most references, the loading factor value higher than 0.50 is considered to have validation that is strong enough to explain the construct [14], [42]–[44].

Table 5. Results of Testing the Loading Factor of Research Models.

Variable		Construct (Indicator)	Estimate
Knowledge	-->	Knowing	0.609
	-->	Understanding	0.779
	-->	Applications	0.680
Attitude	-->	Cognitive	0.661
	-->	Affective	0.759
	-->	Conative	0.690
Behavior	-->	Personal considerations	0.627
	-->	Existence of resources	0.895
	-->	Culture, habits, traditions	0.703

Table 5 shows the results of loading factors from each construct. The explanation can see as follows:

- The value of the loading factor of each latent construct in the latent variable of environmental knowledge obtained the value of loading factor from each construct greater >0.50. From these results, it does not yet have enough validation to explain the latent construct.
- The value of the loading factor of each latent construct in the environmental attitude latent variable obtained the value of loading factor from each construct greater >0.50. From these results, it does not yet have enough validation to explain the latent construct.
- The value of loading factors of each latent construct in the environmental behavior latent variable obtained the value of loading factor from each construct greater >0.50. From these results, it does not yet have enough validation to explain the latent construct.

3.4. Testing of Study Hypotheses

To test the hypothesis about causality developed in this model, it is necessary to examine the null hypothesis which states that the regression coefficient between relationships is zero by observing the value of the Standardized Regression Weights in the Critical Ratio (C.R) column generated by the IBM AMOS Program.

Critical Ratio value compared with the crisis value is ± 2.56 with a significance level of 0.05. If the value of Critical Ratio (C.R) in the variable causality relationship shows higher than the critical value of ± 2.56 or the probability value (P) is smaller than 0.05, then H_0 is rejected, and H1 is accepted [14]. The results of the Standardized Regression Weights can see as follows:

Table 6. Standardized Regression Weights of Knowledge, Attitude Toward Behavior

			Estimate	C.R	Prob. (p)
Knowledge	-->	Behavior	0.619	2.852	0.003
Attitude	-->	Behavior	0.764	5.623	0.000

From the results of SEM analysis using the IBM AMOS Program the following hypotheses can be described:
Hypothesis:

H_0: There is an influence of Knowledge, and attitudes on Behavior;

H_1: There is no Knowledge, and attitudes on Behavior.

Basic Decision Making:

If the Probability Value (p) is <0.05, then H_0 is accepted;

If the Probability Value (p)>0.05 Then H_0 is rejected.

1) Impact of Knowledge on Behavior

Based on the results of SEM analysis using the IBM AMOS Program, the amount of Knowledge to Behavior is 0.619 with a probability value (p) of 0.003. With a probability value (p) <0.05, it is stated that the hypothesis H_0 accepted. It means that there is a significant effect of Knowledge on Behavior.

Angelovska [45], state that environmental awareness is a predictive tool that allows for purchasing behavior of environmentally friendly products and can be the main factor in consumer decision making processes. Environmental awareness is considered a level of commitment and emotionality to various environmental issues [46]. According to Weigel [47], environmental awareness can be considered as a concern for the facts and behavior of oneself with specific consequences for the environment. Stern [48], found that concern or concern for environmental issues can influence attitudes.

Environmental problems are a symptom of the attitude of development that is less aware of the importance of environmental preservation. The development of science and technology causes progress in all fields, while at the same time causing undesirable environmental impacts. The environmental impacts that occur today are mostly due to human actions in development that do not pay attention to environmental sustainability. Humans as subjects of development do not have the right environmental ethics so that they are superior to nature. It results in the ability of the carrying capacity of the environment to decrease because of its exploited natural resources on a large scale for the benefit of human life. In addition to these impacts, a variety of pollution also arises, such as garbage and waste, which increasingly damage the environment.

In terms of education, the gold miners generally do not have education specifically about gold mining. They departed from the experiences they had been doing so far, so they could determine which location or area had gold content or not. In assessing an area containing gold, these gold diggers (financiers) together or individually pioneered by tracing areas, especially the riverside, to observe whether there was gold in the area. If it is believed in the region to contain gold, then the diggers (investors) return to their area first or contact their subordinates to come to the new excavation site. If the gold pioneering and excavation activities succeed, it will become further information for other gold diggers, not only for the gold diggers in the area but for the gold diggers who live in other areas. Furthermore, other gold diggers from various regions in groups and flocked to the new gold mining location.

Among the traditional gold diggers in finding out and searching for information about the location of the new gold digger that was carried out by other gold mining groups. As for the notion of information behavior itself according to Wilson [49], is the whole human behavior related to sources and channels of information, including in this case the search and use of information both actively and passively.

Conraud and Rivas [50], believe that environmental knowledge influenced by ecological ethnocentrism, the level of information, past behavior, and perceptions of green products. A person with a higher level of environmental knowledge will tend to be lazier to do pro-environment activities. His knowledge of the environment made him understand that what he was doing would have excellent or adverse effects on the environment.

According to Barreiro [51],environmental knowledge can be a series ranging from understanding environmental issues and problems to causes, impacts, someone responsible, solutions and agents of responsibility for environmental problems. Knowledge can come from three primary sources, namely cultural traditions, mixing of scientific knowledge about environmental issues, and personal experience. Environmental issues have been present in the media, schools, and those related to natural recreation [52]. It will provide better and new socialization of the environment. Personal experience can only be calculated if someone has formed cognitive design based on their experience. This design must include in the definition, causes, consequences, and who is responsible and solving the environmental problems [53].

Efforts to preserve the environment in Indonesia are only possible if supported by all citizens. Ignorance of the environment causes unconsciousness in the environment, meaning that environmental knowledge influences environmental awareness. In connection with the environmental facts that are currently happening, this caused by ignorance of the community towards the environment. Ignorance of the environment causes unconsciousness in the environment. It can also explain that ignorance of the environment is one of the factors that influence environmental awareness.

2) Impact of Attitudes on Behavior

Based on the results of SEM analysis using the AMOS Program, the magnitude of the effect of law enforcement on participation is 0.000 with a probability value (p) of 0.764. With a probability value (p)< 0.05, it stated that the hypothesis H_0 accepted. It means that there is no significant effect of attitudes on behavior.

The tendency of people to act (tend to behave), meaning that attitude is a component that precedes open action or behavior. Attitude is a square to act or behave openly (actions) [54]. From what see in this study is the attitude of the mining community that allows what is done even though they know the consequences of the activities they carry out, namely pollution of soil, water, and the surrounding environment. Because the aim of the miner is only to obtain gold in the area than when it is deemed no longer productive, the miners leave the site of the former mine that has been polluted and damaged.

As mentioned above, attitude is a tendency to act (practice). Attitudes do not necessarily materialize in action, because the realization of actions requires other factors such as the availability of facilities or infrastructure. Stern and Dietz [55], in their study, suggest that attitudes toward environmental concerns are rooted in one's value system. They argue that the values that someone makes in themselves, others, or plants and animals form the basis of one's attitude towards environmental issues. Each part of this value provides a different basis for environmental concerns because of different reasons [56]. Attitudes determine a person's behavior concerning social stimulus or specific events. Attitude is a condition that allows the emergence of an action or behavior.

Newcomb [17], one of the social psychologists' states that attitude is a readiness or willingness to act and not an implementation of specific motives. In other words, the function of attitude is not an action (open reaction) or activity, but it is a predisposition of behavior (action) or a closed reaction. Campbell [51], says that attitude is a syndrome or a collection of symptoms in response to a stimulus or object. So that attitude involves thoughts, feelings, attention, and other psychological symptoms.

Kilbourne and Pickett [57], found that environmental attitudes directly influence consumers' green behavior. Pro-environment behavior is people who show behavior that is consistent and aware of the concern for purchasing environmentally friendly products. The intention of pro-environment behavior divided into two aspects of right behavior and erratic behavior. Direct behavior is the purchasing behavior of green products. Whereas indirect behavior is general green behavior such as minimizing consumption of resources and energy, recycling, avoiding products that damage the environment, obeying environmental regulations, and becoming an activist [58].

There is a relationship between the number of people (humans) and a decrease in the quality of the environment. The decline in environmental quality by humans consists of 3 factors, namely the number of humans, the number of natural resources used by every human being, and the environmental impact of natural resources used [59]. Increasing population (human) and settling on the banks of the river will affect a person's behavior. Human behavior is related to the environment [60]. One of the relationships between decreasing environmental and human (social) quality is that most of the decline in environmental quality results from human actions or behavior [61]. The human personality itself and the situation/state of the environment will affect the behavior of one's environment [62].

The human attitude at first treats nature excessively by infusing it and adoring it; then humans begin to use nature and depend on it; humans feel they have nature so that it drains and gnaws on nature and its environment; humans feel abandoned by nature and therefore need it; humans are aware that nature must be cared for and approached as an environment that determines its survival as a creature.

Based on the development of this attitude, the attitude of environmental preservation is a form of evaluation of potential feelings and tendencies to react in an effort to maintain, protect and manage and utilize natural resources from the pressure of changes or negative impacts caused by an activity, in order to be able to support human life and other creatures so that they can meet humans from generation to generation. The natural resources in question are biological, non-biological and artificial resources. This attitude will cause us to behave more wisely towards the environment.

Prospective gold mining wants to fight poverty and achieve prosperity for all levels of society. This type of mining is participatory because it involves all social elements. Besides being participatory, this mining also has the determination to advance the interests of the entire nation. What should be a prosperous, just and prosperous life is a local gold mining community. The opening of opportunities or employment in the form of gold mining will automatically pioneer the opportunity to improve living conditions now.

Environmental awareness grows because the environment gets worse. Humans feel that humans need the environment and can change it. Humans are aware of the interests and problems that are being faced by the environment. Environmental awareness shows the general orientation of individuals to the environment. A person's level of concern for environmental issues is a useful predictor of environmentally conscious behavior [63]. Consumers with concern for the environment will find it easier to need and buy environmentally friendly products than those who care less about the environment [64].

4. Conclusions

Environmental damage is an issue that has recently received attention from all walks of life. Based on deep value systems, knowledge and attitudes are important because of the potential impact they have on behavior. However, some researchers state that although environmentally friendly behavior has a positive impact, sometimes it does not guarantee the low impact of the behavior on the environment.

Environmental knowledge and environmentally friendly attitudes are very related and mutually reinforcing, especially in the search for information about environmental issues. People who do not know that their behavior can contribute to environmental damage will continue to behave like that. Therefore, socialization to increase knowledge is vital to do. Increased knowledge, is expected to have an impact on attitudes towards the environment so that harmony between humans and nature maintained.

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