



IDENTIFICATION AND ASSESSMENT OF THE ENVIRONMENTAL IMPACT GENERATED BY THE GOLD ACTIVITY RELAVE, AYACUCHO

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SUMMARY

The present research work presents a description and analysis of the problems and environmental impact of gold mining activity in the province of Ayacucho, which constitutes an academic and scientific interest in the rapid growth process of small-scale mining and artisanal mining. , considered by the State as a mining activity. corridor that produces 70% of the gold from artisanal mining in Peru. The Relave SA Gold Community, an artisanal mining company, in the district of Pullo, province of Parinacochas, Ayacucho, produces up to 2 kg of refined gold monthly; Its mining exploitation is part of the explicit environmental policy and applies waste containment technology to the soil.

The results indicate that mining activity is related to the environmental environment (bilateral significance .001749305), positive relationship (Spearman's rho .761); Mining activity is related to the environmental dimensions, the physical environment (rho .682), the biological environment (rho .774) and the socioeconomic environment (rho .769). The contents of As, Ba, Cd, Cr, Pb, Hg, Cr and CN (laboratory results) in the soil are low, and the salinity and turbidity of water (physicochemical tests) are harmless to human health.

The central and regional governments must formulate, develop and implement awareness-raising focused on the Oro Community of the Relave SA Region in order to raise awareness and objectify the physical, biological and socioeconomic impact generated by mining activity and to mitigate it with friendly mining activity. the impacts.

Keywords: Mining activity, environmental environment, Tailings, Gold Community, physical environment, biological environment, socioeconomic environment.

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DOI: 10.53555/ecb/2022.11.11.141

I. INTRODUCTION

To enrich the environment that surrounds him, since his earthly dawn, man has required to remodel and tame nature (Bunge, 2013) according to his needs, using the elements available in his environment, such as digging into the earth's crust for agricultural activities, housing or mining, the latter to obtain copper, lead, silver, gold among other minerals, which became the right of ownership of the land (Serfati, 2013) and the development of mining activity, which is complex, highly exposed, varied, with an impact on other economic sectors, hence it is a very profitable sector (Concha, 2017).

ALEXIS MONTES DE OCA-RISCO & MAYDA ULLOA-CARCASSÉS, 2013. To carry out the environmental study where the Environmental Quality standards (ECA) have been analyzed. Which, together with other legal devices, form an obligatory part of environmental management in mining, and make the development of sustainable mining projects possible. Where geological cartography zones the main types of rocks, soils and structures (faults, fractures and joints that influence the percolation of underground and surface water), giving importance to lithology.

In Peruvian regulations there are two important parameters to establish water quality, the Environmental Quality Standards (ECA) and the Maximum Permissible Limits (LMP). SUPREME DECREE No. 004-2017-MINAM establishes the ECA as the measure that establishes the level of concentration or degree of elements, substances or physical, chemical and biological parameters, present in the air, water or soil, in their condition as receiving body, which does not represent a significant risk to the health of people and environments. Environmental degradation in the area of mining extractive activity is a concern because anthropogenic pollution and environmental degradation have effects on the impoverishment and erosion of soils that affect agricultural and rural activity, water pollution, and harmful effects on living conditions of the population, labor dependence on mining activity, limited basic infrastructure, services, demographic impact, health, poor urban development, infrastructure and other economic activities.

Environmental liabilities have harmful effects on the environmental, social and economic environment that lead – on the part of the communities adjacent to the mines – to demands for repair and fulfillment of compromised expectations, which, when not met or satisfied, result in socio-environmental conflicts (Viana, 2018), to which small mining is not exempt.

The Relave SA Gold Community is a formal artisanal mining company, located in the district of Pullo, province of Parinacochas, Ayacucho region, small mining, it has eight mining requests of 1,133.85 hectares to exploit; Currently, only the Fe y Alegría Mining Concession of 100 ha is exploited, producing up to 2 kg of refined gold monthly, with a grade of 8 gr/t and silver 16 gr/t. The obtaining of metals in this concession is carried out with the leaching method, which is the absorption of gold using activated carbon. In Lima, the desorption and refining service is carried out, obtaining bar gold as the main product and silver as a by-product.

II. EXPERIMENTAL PART

The Relave annex is an artisanal mining settlement located 5 km from Mollehuaca, which politically belongs to the district of Pullo, Parinacochas (Ayacucho) although geographically and roadwise it is linked to the area of Chala (Arequipa) which is only 42 km from distance. It houses approximately 2000 people. The population comes 80% from Pullo and presents a significant degree of social cohesion related to its communal origin. All the development and common good activities that they agree to promote are done under the system of communal tasks. The population is in the initial phase of implementing a basic population order; separate the housing area from the mineral processing area in quimbaletes. These are concentrating towards the east and north of the housing area. The organizations that exist in Relave are: The Community of Artisanal Miners of Tailing that brings together all the residents, the Parents' Associations of the initial center, the primary school and the secondary school, the Pro-Drinking Water Committee, the Pro Committee -Posta Medica, the Committee that promoted the construction of the chapel and the company AURELSA whose partners are a sector of the Relave miners.

The research has a quantitative, applied, correlational approach. With a random sample of 89 Aurelsa workers, to whom a 32-question questionnaire was applied. The indicators of pollution in the environment in Relave were determined with water analysis in the laboratory, with a water sample from an underground pool 10 m from the Huarango River and 1000 m from the town of Relave. For him soil analysis in the laboratory, a soil sample was taken from the soil in the area surrounding the mine, in the vicinity of the Tailings Population Center (Figure 1).



Figure 1. Tailings Population Center, Pullo district, Parinacochas, Ayacucho.

III. RESULTS AND DISCUSSION

Before presenting the results it is worth mentioning that the mining activity in the Tailings Community has not been the subject of any environmental, health, economic, or social study that would allow

the results of this study to be compared or extrapolated. The descriptive results of the study variables, their dimensions and the testing of the hypotheses are presented below.

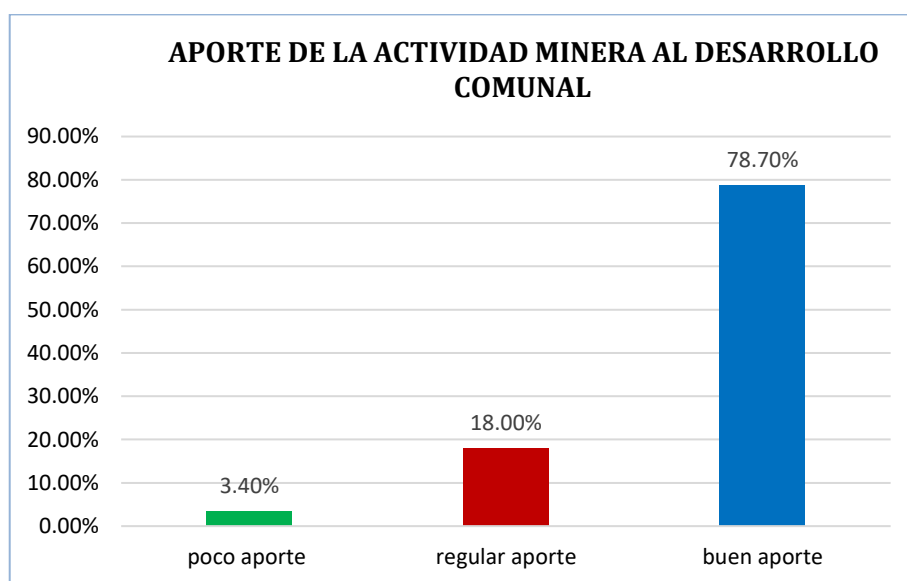


Figure 2. Distribution of frequencies and percentages of the variable Mining activity

In figure 2, 3.4% and 18.0% report that the contribution of the activity mining is little and regular respectively to the achievement of the development objectives of the Tailings Community; 78.7% indicate that mining activity

makes a good contribution to achieving the community's objectives. In short, mining activity has a good contribution to achieving the community's objectives.

Perception of the benefits of mining exploitation at the community level

Table 1. Frequencies and Percentages of the Exploitation Dimension

Alternative	Frequency	Percentage	Valid percentage	Accumulated percentage
Strongly disagree	1	1.1	1.1	1.1
In disagreement	4	4.5	4.5	5.6
Neutral	17	19.1	19.1	24.7
OK	56	62.9	62.9	87.6
Strongly agree	eleven	12.4	12.4	100.0
TOTAL	89	100.0	100.0	

Note. Prepared by the researcher based on the research matrix

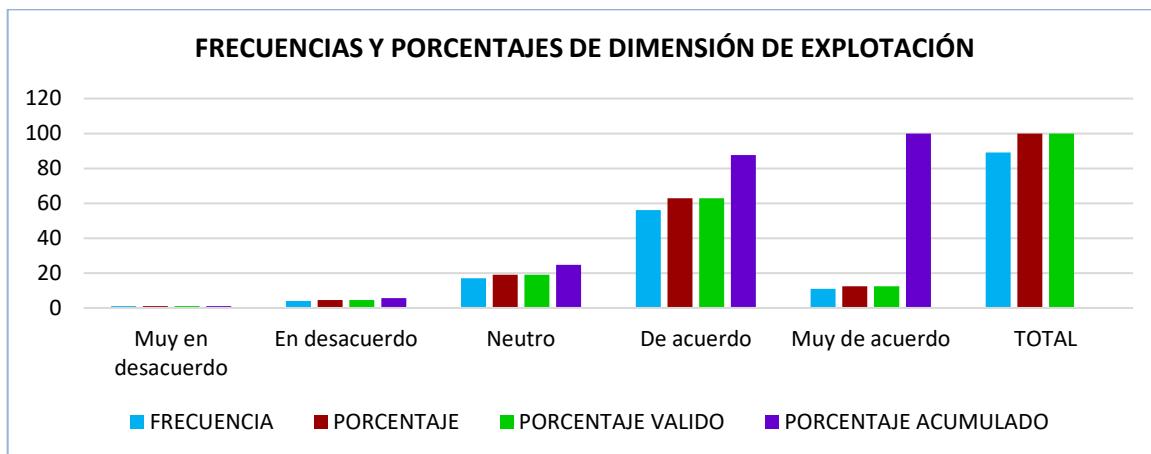


Figure 3. Frequencies and Percentages of the Exploitation Dimension

Table 1 shows that mining activity in terms of its Exploitation dimension, 62.9% of the participants said they 'agreed' and 12.4% "strongly agrees" with the benefits of the exploitation of mining activity.

From the results obtained, it is concluded that, with exploitation, the majority of participants assure that with mining exploitation the objectives of the Relave community can be achieved.

Perception of the benefits of mining activity at the community level

Table 2. Frequencies and Percentages of the Mining Activity Variable, according to the Profit Dimension

Alternative	Frequency	Percentage	Valid percentage	Accumulated percentage
Strongly disagree	0	0.0	0.0	0.0
In disagreement	1	1.1	1.1	1.1
Neutral	9	10.1	10.1	11.2
OK	46	51.7	51.7	62.9
Strongly agree	33	37.1	37.1	100.0
TOTAL	89	100.0	100.0	

Note. Prepared by the researcher based on the research matrix

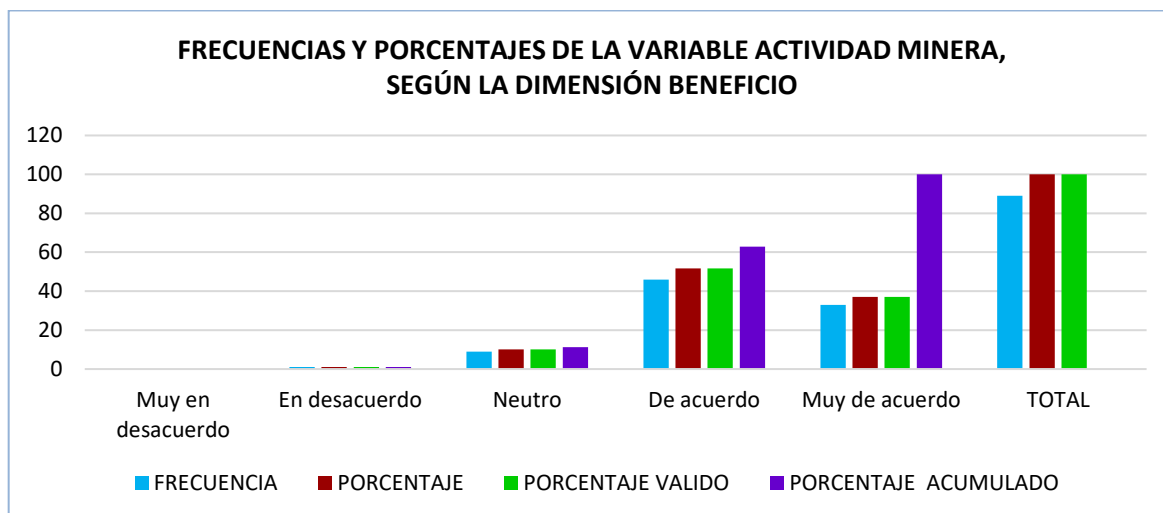


Figure 4. Frequencies and Percentages of the Mining Activity Variable, according to the Profit Dimension

In table 2, 51.7% and 37.1% 'agree' and 'strongly agree' respectively with the benefits of the Beneficiation activities of mining activity.

Concluding that, for the majority, the benefit is the conditions for achieving the community's objectives.

Perception of the benefits of transportation of mining activity in the community

Table 3. Frequencies and Percentages of the Mining Activity Variable, according to the Transportation Dimension

Alternative	Frequency	Percentage	Valid percentage	Accumulated percentage
Strongly disagree	1	1.1	1.1	1.1
In disagreement	2	2.2	2.2	3.4
Neutral	22	24.7	24.7	28.1
OK	57	64.0	64.0	92.1
Strongly agree	7	7.9	7.9	100.0
TOTAL	89	100.0	100.0	

Note. Prepared by the researcher based on the research matrix

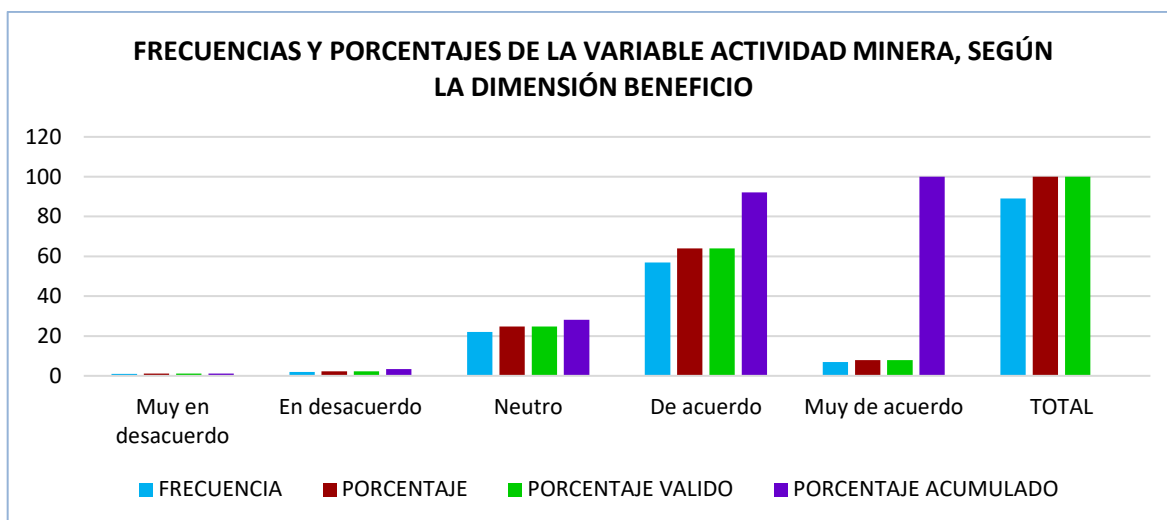


Figure 5. Frequencies and Percentages of the Mining Activity Variable, according to the Transportation Dimension

With respect to transportation in mining activity, 64.0% (table 3) and 7.9% reported being 'agree' and 'strongly agree' respectively with the benefits of

transportation. In short, the majority says that transportation has the conditions to achieve the objectives of the Relave community.

Perception of the impact of mining activity on the environmental environment

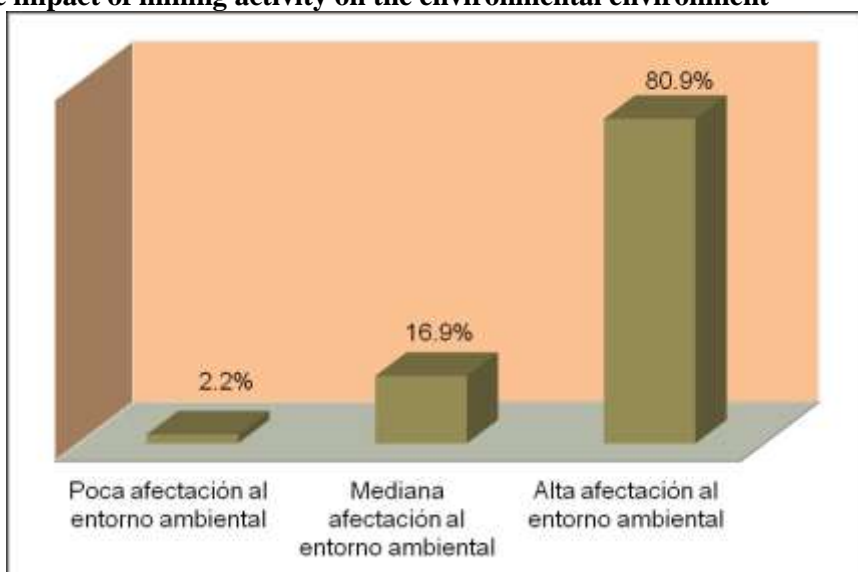


Figure 6. Percentage distribution of the environmental environment variable

In figure 6, 2.2% of the participants report that the activity mining little effect on the environment;

while 16.9% maintain that mining activity mediately affects the environmental

environment and 80.9% indicated that mining activity greatly affects the environmental environment of the Relave community.

Concluding, that the participants perceive that mining activity affects the environmental environment of the community.

Perception of the impact of mining activity on the physical environment of the environmental environment

Table 4 Frequencies and Percentages of the Environmental Environment according to the Physical Environment Dimension

Alternative	Frequency	Percentage	Valid percentage	Accumulated percentage
Strongly disagree	0	0.0	0.0	0.0
In disagreement	2	2.2	2.2	2.2
Neutral	17	19.1	19.1	21.3
OK	61	68.5	68.5	89.9
Strongly agree	9	10.1	10.1	100.0
TOTAL	89	100.0	100.0	

Note. Prepared by the researcher based on the research matrix

Table 4 shows that 2.2% are shown in 'disagreement' that the physical environment of the environmental environment is affected by the mining activity in Tailings, while 19.1% are in a 'neutral' position, then we have that 68.5% indicate that they 'agree' with the damage suffered by the

physical environment and 10.1% indicate that they 'strongly agree' with the impact. From these results we have that the participants 'agree' in the sense that the dimension physical environment (of the mining activity) affects the environmental environment of the Tailings community.

Perception of the impact of mining activity on the biological environment of the environmental environment

Table 5. Frequencies and Percentages of the Environmental Environment according to the Biological Environment Dimension

Alternative	Frequency	Percentage	Valid percentage	Accumulated percentage
Strongly disagree	0	0.0	0.0	0.0
In disagreement	2	2.2	2.2	2.2
Neutral	16	18.0	18.0	20.2
OK	43	48.3	48.3	68.5
Strongly agree	28	31.5	31.5	100.0
TOTAL	89	100.0	100.0	

Note. Prepared by the researcher based on the research matrix

Table 5 shows that 2.2% show 'disagreement' that the biological environment of the environmental environment is affected by the mining activity in Tailings, while 18.0% are in a 'neutral' position, then we have to 48.3% indicate that they 'agree' with the damage suffered by the biological environment and 31.5% indicate that they 'strongly

agree' with the impact. From these results it is clear that the participants They tend to be in an intermediate position between 'agree' and 'strongly agree' that the biological environment is affected by mining activity in the area of the Relave community.

Perception of the impact of mining activity on the socioeconomic environment of the environmental environment

Table 6. Frequencies and Percentages of the Environmental Environment according to the Socioeconomic Environment Dimension

Alternative	Frequency	Percentage	Valid percentage	Accumulated percentage
Strongly disagree	0	0.0	0.0	0.0
In disagreement	1	1.1	1.1	1.1
Neutral	14	15.7	15.7	16.9
OK	40	44.9	44.9	61.8
Strongly agree	3.4	38.2	38.2	100.0
TOTAL	89	100.0	100.0	

Note. Prepared by the researcher based on the research matrix

Table 6 shows that 1.1% are in 'disagreement' that the socioeconomic environment of the environmental environment is affected by mining activity in Tailings, while 15.7% are in a 'neutral' position, then we have that 44.9% indicate that they 'agree' with the damage suffered by the

socioeconomic environment and 38.2% indicate that they 'strongly agree' with the impact. From these results it is clear that the participants they tend to appreciate that they tend to 'strongly agree' that the socioeconomic environment is affected by mining activity in the Relave community area.

Laboratory results on environmental contamination: Soil contamination

Table 7. Soil Analysis Results

Test: LAS01-SD-22-00013								
Sample: Sediment								
Sampling date: June 3, 2022								
Sampling time: 11 am								
Sample reception conditions: Sediment in sealed plastic bag								
Rehearsal date: June 4, 2022								
Sample collection location: Area: Visitors; district: Pullo; province: Parinacochas; region: Ayacucho								
Sampling point and/or coordinates: UTM coordinates. East / North: 200 meters from the Crushing Plant - Aurelsa and 700 meters from the town of Relave.								
RESULTS								
Sample name	*7046 Ace M.T. mg/Kg	*7046 Ba M.T. mg/Kg	*7046 CD M.T. mg/Kg	*7046 Cr M.T. mg/Kg	*7046 Pb M.T. mg/Kg	*7048 Hg mg/Kg	*7040 Cr VI mg/Kg	*7043 free CN mg/Kg
Visitors - Aurelsa	1 680	88.2	20,331	^{to} <0.32	668.76	15.72	^b <0.05	0.17

Note. Results of the soil test carried out at the Southern Analytical Laboratory

The results of the soil analysis (table 7) indicate that soil contamination by As, Ba, Cd, Cr, Pb, Hg, Cr and CN have low levels that do not affect human health, none affect the food chain (Nordberg, 1998)

and lead is far from the high impact found in La Oroya (87%) of the standard for commercial, industrial and extractive soils (Mapleand Calderón, 2017).

Laboratory results on environmental contamination: Pollution in water

Table 8. Water Analysis Results

Test: LAS01-AG-AC-22-00208							
Sample: water sample from a water intake, 1000 meters from the town of Relave							
Sampling date: June 3, 2022							
Sampling time: 15:40							
Sample receiving conditions: Refrigerated cooler							
Rehearsal date: June 4, 2022							
Location of sample collection: Area: Huarango; district: Pullo; province: Parinacochas; region: Ayacucho							
Sampling point and/or coordinates: Underground pool 10 m from the Huarango River and 1000 meters from the Relave town.							
Sample matrix: Natural water – Underground – Spring water							
Sample name: Huarango - Aurelsa							
PHYSICAL-CHEMICAL TEST RESULTS							
*781	*783		*804		*806	*809	*810
Salinity	C.R.	T	Smell	Flavor	Color	CaCO ₃ acidity	Alkalinity CaCO ₃
g/L	mS/cm	°C	Dilution factor at 25°C	Without unit	Pt Co	mg/L	mg.CaCO ₃ /L
0.53	0.830	19.4	Acceptable	Acceptable	^{to} <2	^b <0.80	225

Note. Results of the soil test carried out at the Southern Analytical Laboratory

The results of the chemical-physical analysis of the water (table 8) indicate that the salinity levels (0.53 gr/l) of the water for domestic, irrigation and mining use in the Relave town are good; the organoleptic parameters of the water – odor and taste – of the sample have normal characteristics, that make it acceptable for human consumption; while the color (using platinum-cobalt, Pt-Co) is Pt Co $a < 2$ implies that there is no risk to the health of the Relave community. The physicochemical analysis report indicates that the turbidity of the Relave water is NTU < 0.50 – the WHO indicates that it should be less than 5NTU (Gesta Agua, 2006) –, so there is no risk to human health from this community. The hardness of the water given by the presence of Mg and Ca dissolved in the water, the results of the total hardness CaCO₃ mg/L 336.0, is less than 500 mg/L

indicated in the national standard, so the hardness of the Tailings water indicates that it is consumable without any risk to human health.

Results of the correlation between Mining activity and environmental environment

The results of the statistical analysis (table 9) refer to a relationship $r = .761$ between the variables Mining activity and Environmental environment, indicating that the relationship between the variables is positive and a considerable level of correlation. The significance of Sig. = .001749305 shows that Sig. is less than 0.01, indicating that the relationship is significant. There is a positive and significant relationship between the mining activity and the environmental environment in the Relave SA Gold Community.

Table 9. Spearman Correlation Coefficient of the Variables: Mining Activity and Environmental Environment

			Mining activity	Environmental environment
Spearman's Rho	Mining activity	Correlation coefficient Sig. (bilateral) N	1,000 89	$r = .761^{**}$ Sig. = .001749305 89
	Environmental environment	Correlation coefficient Sig. (bilateral) N	$r = .761^{**}$ Sig. = .001749305 89	1,000 89

** The correlation is significant at the .01 level (two-sided).

Note. Prepared by the researcher based on the research matrix

Results of the correlation between Mining activity and physical environment

The results (table 10) show the existence of a relationship $r = .682$ between Mining Activity and physical environment, positive relationship and medium level of correlation. The significance of

Sig. = .000709406 shows acceptance of the hypothesis. It is concluded that there is a positive and significant relationship between mining activity and the physical environment in the Relave SA Gold Community.

Table 10. Correlation between Variables: Mining Activity and Physical Environment

			Mining activity	Physical environment
Spearman's Rho	Mining activity	Correlation coefficient Sig. (bilateral) N	1,000 89	$r = .682^{**}$ Next = 000709406 89
	Physical environment	Correlation coefficient Sig. (bilateral) N	$r = .682^{**}$ Sig. = .000709406 89	1,000 89

** The correlation is significant at the .01 level (two-sided).

Note. Prepared by the researcher based on the research matrix

Results of the correlation between Mining activity and biological environment

The results (table 11) indicate $r = .774$ between Mining activity and biological environment, positive relationship and medium correlation. The significance Sig. = .001750846 allows us to affirm

that the relationship is significant. It is concluded that there is a positive and significant relationship between mining activity and the biological environment in the Relave SA Gold Community of the Ayacucho Region.

Table 11. Correlation between Variables: Mining Activity and Biological Environment

			Mining activity	biological environment
Spearman's Rho	Mining activity	Correlation coefficient Sig. (bilateral) N	1,000 89	$r = .774^{**}$ Sig. = .001750846 89
	biological environment	Correlation coefficient Sig. (bilateral) N	$r = .774^{**}$ Sig. = .001750846 89	1,000 89

** The correlation is significant at the .01 level (two-sided).

Note. Prepared by the researcher based on the research matrix

Results of the correlation between Mining activity and socioeconomic environment

The results (table 12) indicate $r = .769$ between Mining activity and socioeconomic environment, positive relationship and considerable correlation. The significance of $\text{Sig.} = .000070564$ indicates

significant relationship. It is concluded that there is a positive and significant relationship between the Mining Activity and the Socioeconomic Environment of the Relave SA Gold Community of the Ayacucho Region.

Table 12. Correlation between the Variables: Mining Activity and Socioeconomic Environment

			Mining activity	socioeconomic environment
Spearman's Rho	Mining activity	Correlation coefficient Sig. (bilateral) N	1,000 89	$r = .769^{**}$ Sig. = .000070564 89
	socioeconomic environment	Correlation coefficient Sig. (bilateral) N	$r = .769^{**}$ Sig. = .000070564 89	1,000 89

** The correlation is significant at the .01 level (two-sided).

Note. Prepared by the researcher based on the research matrix

The results obtained in the present study are peculiar to the Relave SA Gold Community, to the extent that there are no similar previous studies or studies of an environmental, economic, social, labor, mining exploitation or health nature, therefore extrapolating the results of The present investigation with other studies carried out in Relave is unlikely. This germinal scope of the present study highlights its importance, which should be a reference to motivate continuing with other studies that help to better understand the reality of Relave through space and time.

The results of mining activity in the physical environment indicate a relationship between them ($r = .682$), denoting a positive and significant relationship between mining activity and the physical environment in the Relave SA Gold Community of the Ayacucho Region. This result is consistent with what was found by Castillo (2019), who determined that the environmental impact of illegal and informal mining in Madre de Dios is devastating, indicating that deforestation and desertification leads to the disappearance of animal and plant species, changes in The water and soil cycle exposes the biodiversity of the jungle to

danger; while the emission of large quantities of mercury that contaminates rivers and soils. Corcuera (2015) indicates that in Cerro Toro the soils are affected by mining activity, by clearing, as well as by cyanidation ponds without retaining walls or a drainage system. In the same direction, Ramírez (2017) specifies that the relevant environmental impacts identified in the Inambari sub-basin, in the physical aspect, manifest themselves in the loss of soil, the alteration of the water table, air quality, the alteration of courses of water, accelerated water erosion, surface soil movement, water turbidity, tailings, sediments and mercury contamination. These results constitute a warning for Relave in case its policy is not strengthened. Explicit environmental, applying waste containment technology to the soil as technological progress could complicate environmental pollution due to the use of mercury that is deposited in the soil, in the blood of human beings, which is cumulative over time and harmful for the health of the population of Relave.

Regarding the mining activity and the biological environment, with a correlation coefficient of $r = .774$ between the Mining Activity and the

biological environment, it indicates that there is a positive and significant relationship. Corroborated by Armendáriz (2016) by finding a direct and significant relationship (Pearson coefficient = .844) in the presence of concessions and the decreed ANP surface, where the contamination risk indicators range from low threat (1.5) to high threat (6.0). Castillo (2019) indicates that gold extraction impacts the lives of animals, plants and entire ecosystems, also affecting the inhabitants of nearby towns. Ramírez (2017) specifies that the relevant environmental impacts identified in the Inambari sub-basin, biologically, there is the movement of the vegetation cover, the displacement of wildlife, the impact on tree species and the alteration of ecosystems.

Regarding mining activity and the socioeconomic environment, a positive and significant relationship ($r = .769$) was found between mining activity and the socioeconomic environment of the Relave SA Gold Community of the Ayacucho Region; results supported by Corcuera (2015), indicating that mining activity generates negative socioeconomic impacts. Kianman (2017) in his study of the influence of mining activity in the province of Cajamarca found that it has had a positive impact on improving the quality of life of the residents of San Nicolás by 85%, Polloc 94%, Yanacancha Grande 38 % and Progress by 35%; On the other hand, in the Encañada district, 100% of the Rodacocha and Sogoron Alto residents do not perceive improvements in their quality of life; Nuevo Triunfo in 95%, Chanta 99% its surroundings. Ramírez (2017) specifies that the relevant environmental impacts identified in the Inambari sub-basin, in the socioeconomic aspect, are the conflict over land use, sources of economic income, impact on public health, occupational health, and crime.

IV. CONCLUSIONS

1. With the bilateral significance test (.001749305), the activity mining is related to the environmental environment of the Community Aurifera Relave SA of the Ayacucho Region positively and significantly (Spearman's rho = .761). The results of soil analysis indicate that the content levels of As, Ba, Cd, Cr, Pb, Hg, Cr and CN on the land surface of Relave are low and do not represent any danger, for the moment, to human health and the food chain and this is consistent with the Posta de Health in this Population Center does not report any case of poisoning from the content of these minerals in the population of this community. The chemical-physical analysis

of Relave water reports salinity levels (0.53 gr/l) apparent for domestic consumption, irrigation and mining, while the organoleptic parameters of water indicate normal characteristics, which is acceptable for human consumption; Likewise, the color (Pt Co $a < 2$) indicates that it is suitable for health; The turbidity of Relave water is NTU < 0.50 , indicative of the absence of risk to human health; and finally, in the total hardness of the water, CaCO_3 mg/L 336.0 was found, indicating that this water can be consumed without risk to human health.

2. Mining activity is related to the physical environment of the environmental environment in Relave SA Gold Community of the Ayacucho Region, this because the bilateral significance is .000709406, and the relationship is significant positive (Spearman's rho = .682). This relationship is evidenced because with mining activity the population of this community observes that in some areas of Relave the fluvial dynamics (loss of water mass, variation in the water table), the waters show contamination with heavy metals, observe soil erosion, deforestation, loss of fertile soil, destabilization of slopes, alteration of the water table (water accumulated in the subsoil), the solid emissions (dust emitted) from mining exploitation have influenced the variation of the air, containing aerosols with toxic substances that affect the health of the residents of Relave, they also point out that the variation of the air due to aeolian removal (wind) that transports highly toxic compounds such as sodium cyanide for gold extraction, affects the population of this community.
3. Mining activity is related to the socioeconomic environment of the environmental environment in Relave SA Gold Community of the Ayacucho Region, this is based on the bilateral significance test of .000070564. This relationship is based on the fact that the community of Relave is classified as a population in extreme poverty, with lack of public services, low quality of life that mining exploitation still cannot satisfy; Its urban growth is spontaneous, disorderly and informal, mixing its housing, commercial and mineral treatment space; They also point out that mining exploitation in Relave affects the improvement of infrastructure and health care, which occurs in activities such as the prevention of mercury contamination and the preventive promotional reinforcement of better health care and nutrition for children and pregnant women; and that mining activity in the Relave Population Center

has improved health care, such as the promotion of hygiene and occupational health.

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