



# MINING SOCIAL RESPONSIBILITY AND LEAD CONTAMINATION IN CHILDREN IN THE CITY OF CERRO DE PASCO

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## Abstract

This study analyzes and determines the intake of lead in the blood of children in Cerro de Pasco produced by mining contamination in an evident breach of social responsibility. It is qualitative research, oriented by the interpretative paradigm, where the phenomenological and hermeneutic designs were used to explore the experiences of the participants. The two techniques applied were in-depth interviews with ten people, members of a heterogeneous group, all of them with extensive knowledge and experience with mining contamination and its aftermath with toxic gases produced by the extractive activities of companies such as Cooper Corporation, Centromín Perú, and Volcan, as well as the documentary analysis technique that allowed contrasting the qualitative results. The study meets scientific criteria, such as credibility, transferability, dependability and confirmability. It was concluded that lead contamination in the blood of children is the result of overexposure to mining tailings and that, over a hundred years on average, they have acted without complying with an authentic social responsibility. The children who live near these tailings are the ones who have been most contaminated and continue to be contaminated with lead in their bodies and the companies have not complied with their social responsibility. Volcan, the current mining company, has been fined for environmental infractions due to a lack of social responsibility to preserve the life and health of the Cerro de Pasco population and the environment as a whole.

6531

**KeyWords:** mining pollution, lead contamination, children contaminated with lead, social responsibility.

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## Introduction

Mining activities in the world are a necessity to generate economic resources, create jobs for people and contribute to the development of technologies. However, failure to comply with social responsibility policies can have a negative impact on the environment, exacerbating environmental pollution and affecting the flora and fauna, especially the health and lives of men and women who are exposed to mine tailings and the gases they emanate, among other things. For decades, mining companies in this part of the country have carried out their activities internally (mines or pits) and externally (open pits).

In addition, Garcia et al. (2020) mention that mining activity, by its very nature, causes controversy, conflicts and rejection. For this reason, mining companies require a social license to operate that aims to reduce resistance and opposition from local communities.

Extractive activities have always been carried out within the city, to such an extent that the city has now been left as if it were a circle with a large hole in the middle. Some houses are located around the large open pit. The population practically coexists with mining, because it is constantly exposed to particulate materials. 49.2% of these activities are associated with mining and quarrying (Hernández et al., 2016). There is a direct link between the work center area and the environment, constituting the main source of contamination, so occupational and environmental health are closely linked by common methods, such as health assessment and exposure control.

On the other hand, Cantoral et al. (2015) mention that the adverse effects of lead exposure occur in all age groups, which increases in people who have nutritional deficiencies and live in conditions of poverty. In addition, it also mentions that exposure to subjects from an early age has irreversible effects on the entire organic system. It can generate learning problems in infants, even affecting attention span; it can exacerbate acts of violence and aggressiveness (Nevin, 2000).

15% of the child population tends to develop an

IQ five points less than those who are not exposed to this metal (Caravanos et al., 2014). Also, it has been proven that the presence of lead in a person's body has direct effects on organic components and the brain, seriously affecting the development and mental capacity of children. Although the human body needs small doses of lead, its excessive presence can alter biochemical and/or physiological processes in the organism.

Similarly, Castro and Suysuy (2020) mention that as a result of the constant growth of environmental problems, many of the dimensions of people's lives are harmed, one of which is education. However, there is a social responsibility that focuses on the formation of people with a commitment to the welfare of the ecosystem.

In reality, what makes lead toxic is not its chemical characteristics, but the excessive concentrations and, above all, the type of compound or metabolite that it forms, that is, methylmercury. It is necessary to take into account consider that the interactions between metals and their toxic implications can complicate diseases in people (Hernandez and Hansen, 2012).

Thus, from a theoretical perspective, the contamination of human blood with lead refers to the presence of lead in the human body. Lead (Pb), presents in its nomenclature the atomic number 82, atomic weight 207 and is bluish in color; it forms many salts, oxides and organometallic compounds, it is found in uranium and thorium metals, because it comes from radioactive division. Although commercial ores have little lead (3%), being the common 10%; however, ores before smelting have up to 40% or more lead (Rahimi, 2013).

In recent decades, the crisis of ecosystems and resources has led to the advent of an environmental crisis as a result of the intertwining of nature and society (de Oliveira Gomes et al., 2020). Therefore, issues related to the modes of effective management of resources, their use, preservation and balancing of interests.

In this context, three counterparts appear in the stages of socio-environmental conflicts: (i) the State, (ii) mining companies, in charge of



approving and directly exploiting natural resources and (iii) rural communities and environmental movements seeking the protection of ecosystems, their territories and local economies (Mohle, 2021). In this framework, the modes of discussion are related to interest groups that lead to the creation of governance agreements; along with the legacy of conflict related to socio-environmental issues that, depending on the context, have perpetuated a "culture of conflict" in territories with great socio-environmental wealth (Filomeno et al., 2020), as is the case of the current mining company: Volcan, which carries out extractive mining activities and with evident environmental contamination.

Corporate Social Responsibility has a difficult history in mining, where the industry has moved to restructure itself through a series of global initiatives that implement ways in which mining can and does contribute to sustainable development (Oblitas et al., 2019).

According to Dahlsrud (2008), there are several definitions of Corporate Social Responsibility, one of them refers to a type of private business self-regulation that promotes social objectives and business activities that companies carry out voluntarily and ethically in their communities to benefit the population. Another refers to the fact that it usually occurs when a company offers to contribute part of its profits and/or resources to the development of the community where it carries out its activities.

This study is justified in the sense that social responsibility is a matter that mining companies must comply with in their extractive activities, in order not to affect the environment and, above all, the health and lives of people who are directly exposed, as is the case of the children of the city of Cerro de Pasco. Constantly, many inhabitants of that city participated in marches to the Peruvian capital to demand that the health authorities, among others, attend to their claims regarding the sanitary treatment of their children who are contaminated with lead in their blood. However, their claims were not resolved, which has caused unrest among the entire population of this part of the country. In this social and sanitary conflict, no one has mentioned the social

responsibility of the companies that have extracted or are extracting mineral resources from the subsoil.

Regarding mining pollution, an environmental management system (EMS) must be implemented, whose definition is based on the total management system sector, planning of activities, responsibilities, practices, processes and resources to develop, innovate, implement, verify and sustain the environmental policy Bastidas (2019), (Nieves et al., 2022).

It is important to discuss environmental management systems related to social responsibility and seen from mining competitiveness, provided that Carmona et al. (2017) say that environmental management has been introduced in mining companies where the fact of implementing an environmental plan and being socially responsible, gives an added value to the final product. That is, mining competitiveness has reached such a point where the social responsibility they should have is seen as a competitive advantage; however, this generates a positive impact on communities, since the damage of mining to communities is diminished.

Corporate Social Responsibility is important to mention, which is a basis in ethical principles and legal requirements applied to improve the environment where the organization operates, and have a responsible stance before impacting its activities, despite implementing CSR (Corporate Social Responsibility), the mining sector in Latin America has many gaps in its application, with a negative consequence, linked to corruption, socio-environmental conflict and damage to the ecosystem (Zarate, 2021).

It is also important to publicize mining rehabilitation, which is one of the mechanisms applied to compensate for the decline of mined areas and in many countries, it is described as an important instrument in public policies. Its objective is to prioritize the correction of negative environmental impacts, giving a final use to the rehabilitated land (Torres et al., 2019).

In Latin America, several conflicts were identified where natural resources are involved, among which significant damage to protected



ecosystems with wide biodiversity and air pollution stand out. In Ecuador, water bodies and water sources were found to be contaminated as a result of extractive activities caused by mining, which are carried out with few environmental precautions (Arteta et al., 2018).

**MATERIALS AND METHODS**

The research was conducted following the interpretative paradigm, which consists of approaching a given social phenomenon to understand and comprehend it through the interpretation of data. The method applied was the inductive method, which consisted of starting from the specific to reach the general in the research. Two designs were used: phenomenological and hermeneutic. The research participants were ten, who formed a heterogeneous group but linked to the city of Cerro de Pasco (inhabitants and former inhabitants), with ample knowledge and experience with mining activities and environmental contamination.

**Table 1 Participants in the study**

- E1: lawyer, a litigator in cases of social problems related to mining companies.
- E2: ex funcionario del gobierno regional de Pasco, asesor de gobiernos locales y especialista en temas de responsabilidad social.
- E3: media journalist and advisor to public institutions.
- E4: public health professional.
- E5: Professor at the Universidad Nacional Daniel Alcides Carrión de Cerro de Pasco, political and social analyst.
- E6: Director of an educational institution, formerly run by Cooper Corporation and Centromín Perú.
- E7: Certified Public Accountant and president of the Pasco Chamber of Commerce.
- E8: Mining engineer, a worker for the Cerro de Pasco mining company.
- E9: Geological Engineer, worker of the Cerro de Pasco mining company.
- E10: Metallurgical engineer, consultant to mining and metallurgical companies.

The data collection techniques used in the inductive process were in-depth interviews and observation. The first consisted of applying an interview guide (instrument) with initial questions (categories) and, during the development of the interview, other questions emerged, which gave room for emerging

subcategories. The other technique was a direct observation, through which the presence of mining tailings was recorded to make an exhaustive description that made possible the complementary analysis to the interviews, to consolidate the final report.

**Table 2 In-depth interview script for participants**

- Knowledge of children contaminated with lead in blood
- Mining contamination due to the effect of extractive activities
- Knowledge of the activities of Cooper Corporation and other mining companies.
- Accumulation of mine tailings in the city and its surroundings
- Implementation of measures to counteract mining contamination
- Mining Social Responsibility in Cerro de Pasco
- Mining environmental policy strategies
- Governmental and local institutional control to reduce environmental contamination

**Table 3 Categorization matrix**

- Category 1: environmental pollution, the product of mining activities 6534
- Subcategory 1: extractive mining activities
- Subcategory 2: environmental impact on the health of the population.
- Category 2: lead contamination in children
- Subcategory 1: solid waste management (mine tailings)
- Subcategory 2: cases of children contaminated with lead in their blood.
- Category 3: Mining Social Responsibility
- Subcategory 1: performance of past and present mining companies
- Subcategory 2: mining social responsibility policies

**Table 4 Phases of content analysis of in-depth interview responses**

- Content analysis**
- Transcription of in-depth interview questions and answers
- Coding of interview responses
- First turn**
- Introduction of codes to Atlas.ti qualitative software.
- Elaboration of qualitative maps
- Second turn**
- Analysis of results by categories and subcategories



Interpretation of categories and subcategories

Discussion of results (empirical and theoretical triangulation)

Conclusions

The data were processed with Atlas.ti, software that was used to code the data based on the responses of the interviewees; subsequently, when qualitative maps were created, they were analyzed, interpreted and discussed (triangulation) with previous studies, theories and conceptual approaches.

The research meets the quality criteria in terms of its scientificity. It meets the criterion of credibility since abundant information has been collected during several months of fieldwork. The in-depth interviews applied to the participants are transcribed in Word (open questions and answers). The full and deep meaning of the experiences of the participants, who have lived for a long time - some of them still live - in the same city where there are still mining tailings, contaminated lagoons, and even many of the streets still contain mining tailings, has been captured.

The transferability criterion is met since the data obtained will be useful for future research since mining contamination is a palpable fact;

noncompliance with SR is also a fact; children with lead in their blood are still living a few meters away from the mining tailings. Studying the incidence of this health and social problem caused by the companies in their desire for profit, whether in school achievement, motor skills (gross and fine), or socio-emotional development, among others, corresponds to future research. The criterion of dependence is met, in that the data can be reviewed by other researchers and they will arrive at the identification of similar categories and congruent interpretations (internal dependence) and that different researchers will also be able to identify similar categories in the same research environment. The criterion of confirmability, which is linked to credibility, is met, in that the data can be audited or traced because there is evidence (interviews).

### RESULTS AND DISCUSSION

The qualitative results of the research, after the process of data analysis, categorization and interpretation, are presented below:

1. Category: environmental pollution produced by mining activity

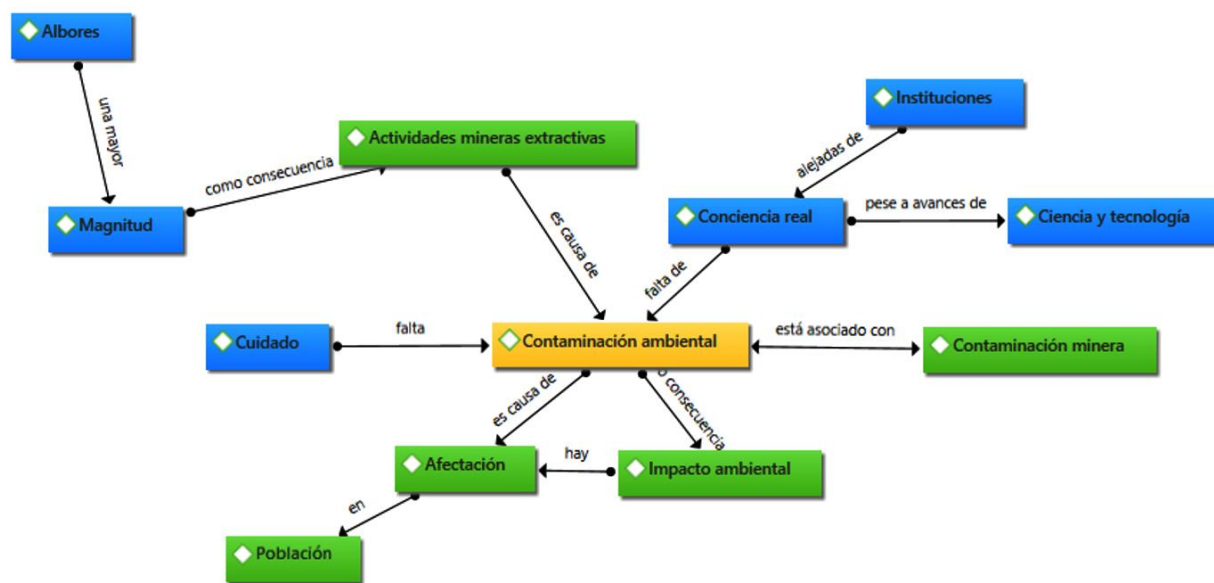


Figure 1. Environmental contamination in Cerro de Pasco as a result of extractive mining activities.



There is no known practice aimed at caring for the environment and Cerreña society in general, since the beginning of extractive mining activities; this means that pollution has been occurring since the dawn of mining exploitation and has affected (and even continues to affect) mainly local people. "Since a long time ago, practically since when mining began in the area hundreds of years ago" (E1). At that time, "they did not have control over the environmental impact" (E7). Although many tens of years ago there was no real awareness of the magnitude of mining pollution, due, among others, to the incipient advance of science and technology, only in the last few years has there been awareness of the problem itself, with information and the participation of institutions and NGOs, as is the case of the Labor Center for Popular Culture. "It is enough the documentation and information, past and updated, that this institution has on these topics, offering its readings to the public and anyone interested, in its library located in the very center of the city" (E1); "the information was gaining strength through the media until it reached the media in Lima and the emergency was declared in the district of Simon Bolivar"

(E3). "Approximately twenty or thirty years ago, Cerreños became aware, that is, since then, information, studies and medical diagnoses were progressively generated about this reality and its corresponding dissemination to the population (E1). There is enough documentation and information, past and updated, that this institution has on these topics, offering its readings to the public and anyone interested in its library located in the center of the city" (E2).

The fact that mining activity has been going on in Cerro de Pasco for a long time is not a problem in itself, but rather the methods of extraction and the failure to implement strategies for optimal waste management, especially in open-pit mining. As Castro and Suisuy (2020) point out, large-scale mining is the most predatory, especially when it carries out open-pit mining activities that raze entire hills; in addition, highly polluting chemicals are used to leach the minerals. The Quiulacocha lagoon, once a natural reservoir of crystalline waters and small fish (chalhuitas), was contaminated and used as a reservoir for mining tailings.

2. Category: lead contamination in children

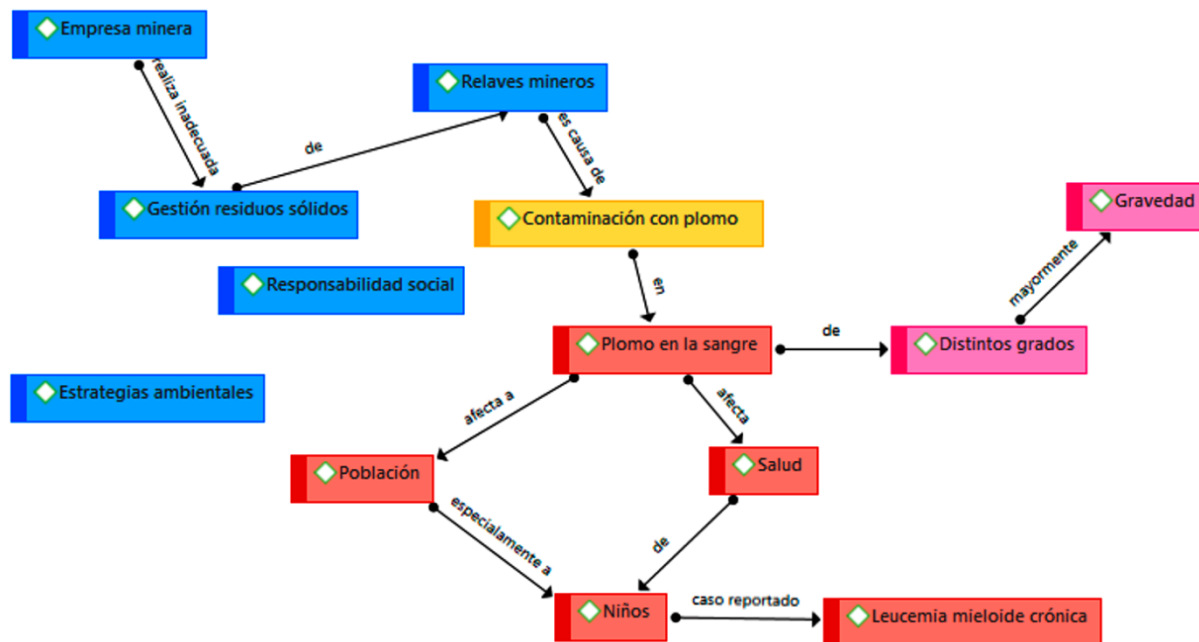


Figure 2. Lead contamination in children as a result of mining activities.

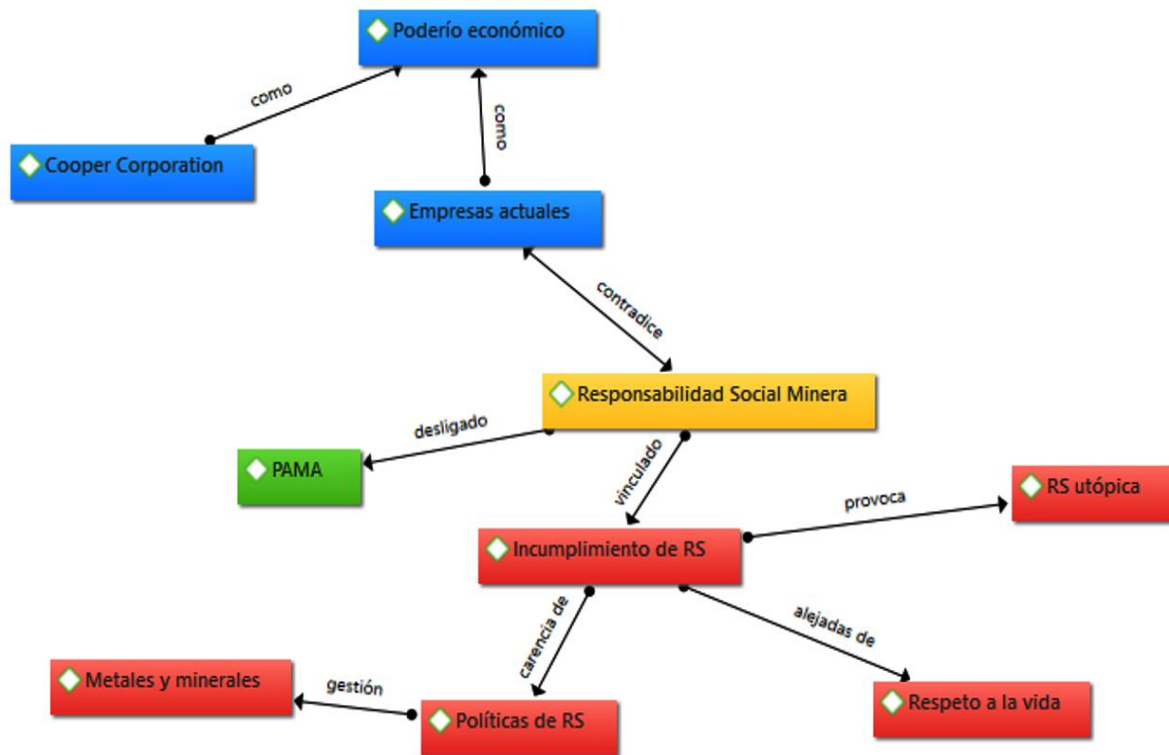


The existence of children contaminated with lead in their blood in the city of Cerro de Pasco is a reality; there is evidence in this regard. The study conducted by Astete et al. (2009) on a sample of 112 children between one and ten years of age living in areas near the mine tailings (Quiulacocha and Champamarca) showed that four out of ten children had lead poisoning. Most children (55.8%) were chronically malnourished; 23% were anemic and 5.9% were mentally retarded.

According to those interviewed, mining activities have not only affected the environment but also people's health, to varying degrees and severity, "in the case of a family with the loss of sight and speech", "My family and I have high doses of lead in our blood" (E1). This fact, of affirming that they have lead in their bodies, is evidence that there is a serious problem, which is unacceptable and which is not consistent with the responsibility of

the mining companies that have been extracting minerals without adequate waste management. Children with lead in their blood are there, they continue to live in direct contact with mining tailings. "We know of children whose blood is contaminated with lead, especially those who live near the tailings and who show symptoms of discomfort" (E2). "This is the case of Kiara, who was diagnosed with chronic myeloid leukemia because of lead and arsenic in her blood" (E3). "There are known cases of children presumably contaminated with lead and other heavy metals through clinical diagnoses" (E4). People should not continue living in areas close to mining tailings because of the health risks they pose; mining companies should implement strategies to avoid the environmental consequences of their activities (Nieves et al., 2022).

3. Category: Mining Social Responsibility.



**Figure 3. Mining Social Responsibility of extractive companies in Cerro de Pasco.**

Based on the premise that if SR is applied in an adequate and sustained manner, then the impact of mining activities will be positive on the environment and the population in general. However, the evidence that the mining tailings

are out in the open - and have been for a long time - close to the social populations, means that the measures for prevention and care of the environment were not complied with, which means that SR was not fulfilled.



All those interviewed responded that the companies, except for the case of the former Cooper Corporation, which had implemented SR policies, the others simply did not comply with them. "Since nationalization in Centromín Perú and then with privatization, there has been no reliable SR work, they only do it when they are going to have a supervision, even the famous PAMA (Program for Environmental Adaptation and Management) has not been complied with up to now" (E2). "Social responsibility policies are the ones that have least interested the different mining companies that have profited, at different times, from mining in Cerro de Pasco" (E1). "SR is not part of their relationship strategy with their environment of influence" (E3); "and the PAMA was never adequate in the environment of the city until today there are remains of metals and minerals around the entire city" (E4). "The compliance with the S.R. was always a utopia, they have never been implemented to have clean mining and to have spaces for harmonious living with society. The people have always demanded respect for life, but the mining companies, with their economic power, did not pay attention" (E5).

The unanimous response of the research participants that mining companies have not complied with SR in their extractive activities constitutes a clear violation of people's constitutional rights: the right to life and health, especially of defenseless and vulnerable beings: children. Even if only one child has lead in his blood as a consequence of the environmental contamination generated by the companies' non-compliance with the SR, it means an attack against the health of the minor, whose right to health, contemplated in the Magna Carta, is taken away.

To reinforce the idea that the impact of mining is harmful to people, especially children, Astete et al. (2009) conclude that communities near mining tailings have high levels of lead poisoning in children under 10 years of age, and also mention that these children may suffer from different diseases such as chronic malnutrition, anemia, parasitosis and a certain delay in psychomotor development. This generates that children lead an inferior lifestyle and that they

cannot develop adequately, since they are harmed by different diseases caused by exposure to mine tailings.

Diaz (2019) mentions that humans have a close bond of dependence on nature. The balance between man and the environment that surrounds us is of utmost importance to reach a development of his person in several dimensions, among them, his quality of life. In addition, Peru has been affected by environmental pollution, showing the damage caused to the vulnerable population.

## CONCLUSIONS

Lead contamination in the blood of children in the city of Cerro de Pasco is due to the overexposure of mining tailings and toxic gases produced by the extractive activities of companies that have acted for over a hundred years without complying with a true social responsibility that, if it had been applied, there would be no contamination of soils, lagoons and rivers, nor of the population, especially the vulnerable sector: children. The claims of the inhabitants, evidenced by "sacrificial marches" from the city to the capital Lima, have been echoed in the media, but not in the health sector, despite the State's commitment to building a care center for children victims. At present, there are still mining tailings in large areas of the city, tailings that have been accumulating for years before the passivity of the authorities. The governmental control to enforce the RS did not take place, in addition to the absence of measures to care for the affected children, who continue to live with lead in their bodies and to coexist with the ills that this entails. Volcan, the current mining company, has been fined for environmental infractions due to the lack of social responsibility to preserve the life and health of the Cerreña population and the environment as a whole.

It is recommended to mining companies to reduce the impact they cause on the affected communities whose lifestyle is harmed by the activity that these companies practice, because of this people are seen with a lower quality of life than a person who is not exposed to mining





activity, therefore they should implement environmental management systems with appropriate environmental plans to reduce and prevent this negative impact on the lives of communities that are exposed to the impacts of mining. It is important to take this into account, as it is the most effective way to reduce this impact.

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