



# Mining Practices and Its Implications on Physical and Socio-Economic Environment of Yubdo District, West Wollega Zone, Ethiopia

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**Abstract:** The main aim of the study was to assess the implications of mining practices on physical and socio-economic environment of Yubdo district, West Wollega Zone, Ethiopia. The study area was purposively selected and survey questionnaire were administered to 170 systematically selected respondents. The study has employed descriptive survey design. Both primary and secondary data were used for data collection. Data collection tools include field observation, questionnaire, Focus Group Discussions, interview and documentary review. Likert scoring method was used to rank the importance of the statement responded by the respondents. The results of these data were statistically analyzed and diagrammatically displayed in the forms of tables and percentage. The qualitative data were organized in to manageable size and analyzed qualitatively. The study found out that mining practices impacted the physical (land, forest, biodiversity, water resources) environment of Yubdo to the large extent. The study also revealed that the contribution of mining to socio-economic environment of the study area is insignificant. The study concludes that mining practices in the study area has negatively affected the physical and socio-economic environment of Yubdo environment. Based on the finding of this study, it is recommended that there is a need of enforcing the environmental regulations and laws so as to implement environmental management plan to mitigate the impacted area. The integration and collaboration of different stakeholders is very important to mitigate the negative effects associated with mining practices.

**Keywords:** Artisanal Mining, Mining Activities, Small Scale Mining, Platinum, Traditional Mining, Yubdo District

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## 1. Introduction

### 1.1. Background

Mineral deposits are assets that can be used beneficially for mankind. Minerals forming deposits are regarded as non-renewable resources and are used by man for material, sustenance of life and energy requirements [23]. Mining has an essential foundation for human development through creation of wealth [1]. It contributes significantly to economic growth and development in most world economies [28]. Traditional mining countries such as USA, Canada, Australia, South Africa and Chile dominate the global mining Scene. These countries have become the traditional leaders in mining and exploration methods and technology [27].

Many Africa countries are naturally blessed with numerous

minerals. Mining and trading of these resources helped to establish and support major trading centers in the Sahel, along the cost of the Niger River [31]. Ministry of Mining and Energy (2012) cited in Beyene shows that gold, tantalum, phosphorus, iron, salt, potash, soda ash, gemstones, coal, geothermal and natural gas were mineral resources discovered in Ethiopia. There are also high potential areas for small scale and artisanal mining, and the activities are mostly concentrated in the greenstone belts located in the tip north, west, and south part of Ethiopia, close to the borders of neighboring countries [9].

There are textural, chemical data, and the genesis of the platinum mineralization of Yubdo district [29]. According to Belete, K. H., Mogessie, A. & Hoinkes, K., platinum and gold mining in Yubdo is open pit mining operation [8]. The mining companies in some countries are required to follow

environmental and rehabilitation codes insuring area mined is returned closes to its original state [30]. But the mining operation in Yubdo district left the impacted area without rehabilitation. The environmental, social and economic issues of the area were not given special attention. From the review of literature, the researcher has not come on research conducted on this area. There is a research gap about the effect of mining practice on the environment, social and economic condition of the Yubdo district. Therefore, to fulfill the existing gap, this study was needed with special emphasis in assessing mining practices and its implication on physical and socio-economic environment in Yubdo district.

## 1.2. Objective of the Study

### 1.2.1. General Objective

The overall aim of the study was to examine mining practices and its implication on physical and socio-economic environment of Yubdo district, West Wollega Zone, Ethiopia.

### 1.2.2. Specific Objectives

Specifically the study attempt to:

- 1) assess effects of mining practices on physical environments of the study area
- 2) assess effects of mining on socio-economic environments of the study area

## 2. Materials and Methods

### 2.1. Study Area

The study was conducted in Yubdo district Western Wollega Administrative Zone, Oromia Regional State, Ethiopia. It is located between 03°25'00"N - 18°00'00"N latitude and 33°00' 00" E - 48°00'00" E longitude at 541km from Addis Ababa. The district lies within altitude ranges of 1650 –1800 m a.s.l.

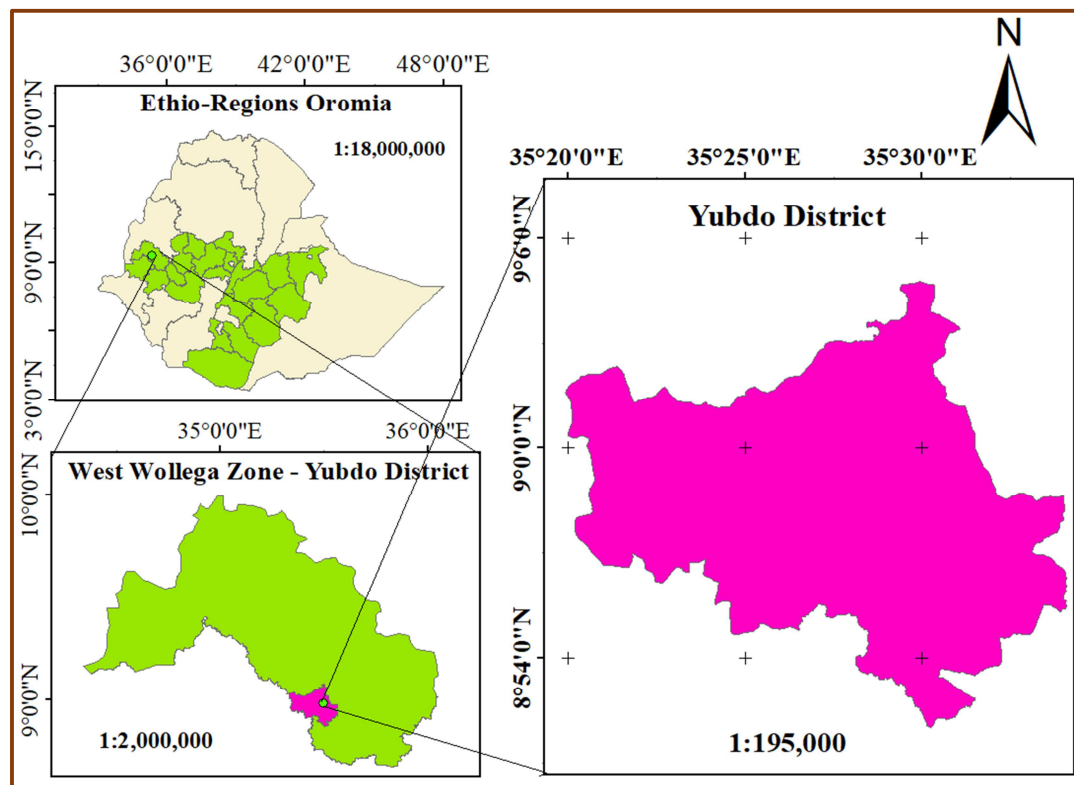


Figure 1. Map of the Study Area: Source: (Own Construct).

## 2.2. Research Design

Since the aim of the study is to assess the mining and its implication on physical and socio-economic environment, descriptive survey design was adopted. Because descriptive survey design is used to obtain appropriate information, for describing the existing situation, narrating facts and investigating phenomena.

## 2.3. Sampling Technique and Sample Size Determination

Purposive sampling technique was used to select the study

area. The major mining areas in the district are Jarso Boloso, Chisa Bori, Alaku Ayira, Alaku Dogoma, Yubdo 01, Yubdo 02, Burayu Bake, Jarso Komto and Jawi Koboshe areas. From these villages, Alaku Ayira, Yubdo 01 and Burayu Bake were purposively selected based on the severity of the problem associated with mining. To determine sample size of households participated in the study area, the formula developed by Cochran cited in [10] was used. In this case, the original sample size was derived and given as:  $n_0 = \frac{z^2 pq}{e^2}$  Where,  $n_0$  = the original sampled size derived,  $z$  = the critical value of confidence level (1.96),  $P$  = Estimated

population proportion 0.5 at 95% confidence level,  $q = 1-p$ ,  $e$  = The desired degree of precision (7%). Accordingly,  $no = (1.96)^2 \times 0.5 \times 1 - 0.5 / (0.07)^2 = 196$ . Then the sample

size of the study was determined by using the formula:  $n = \frac{no}{1 + (no - 1)/N}$  Where;  $n_o$  = the original derived sampled size,  $n$  = sample size of households,  $N$  = total number of housing units.  $n = \frac{196}{1 + (196 - 1)/1286} = 170$ .

Respondents were randomly selected at interval based on the following formula:  $K = \frac{N}{n}$ , where,  $K$  = the sampling interval,  $N$  = the total number population of households in the area, and  $n$  = the total number of sampled households. For this study, sample size,  $n = 170$ ,  $N = 1287$  and the sampling interval,  $K = \frac{1287}{170} = 8$ . Hence, the sample interval  $K$  is 8 and the first item was randomly selected and every 8<sup>th</sup> households from the source list of each area were sampled for this study.

#### 2.4. Data Collection

Both primary and secondary data sources were used for the study. Primary data were collected through questionnaire, field observation, key informant interview, focus group discussion and, secondary data were gathered from previously documented materials.

#### 2.5. Data Analysis

The quantitative primary data collected with questionnaires were analyzed by descriptive method. They were summarized and analyzed by employing different methods and entered in to Excel and then transferred in to

Statistical Package for Social Sciences (SPSS) Program version 22 software. The results of the quantitative data were diagrammatically displayed in the forms of tables and percentage. Using the Likert scoring method, point scores from the respondents were calculated for each statement and ranked to determine the order of importance of the statements. The overall rank score was obtained by adding up all the scores from all participants and the total score expressed as a percentage of the maximum possible score for all the factors. Based on the overall scores, the statements were ranked in order of their importance as determined by the weights of the responses. The formula (1) below was used to calculate the overall Likert scores for the statements: where  $S_c$  is the overall rank score for a given statement,  $n_i$  is the number of responses for a statement of weight  $i$  (where  $i = 1, 2, \dots, 5$ ),  $5N$  is the highest score assuming all respondents strongly agreed with a given statement (where  $i = 5$ ), and  $N$  is the sample size [20]. The qualitative data such as field observations, key informants interviews and focus group discussion were analyzed qualitatively.

### 3. Results and Discussions

#### 3.1. Implication of Mining Practices on Physical Environment of Yubdo

The environmental elements considered for assessing the in this sub section were land, water, forest and biodiversity. Mining activity has affected the natural resources; land, waters, plants and biodiversity of Yubdo area. Table 1 shows respondents' responses on impacts of mining on bio-physical environments.

**Table 1.** Respondents' responses on the impacts of mining on the bio-physical environment.

No	Impacts of mining	Degree of Agreement					Total score	Percentage of maximum Score
		5	4	3	2	1		
1.	Land degradation	715	96	9	0	0	820	96.4
2.	Forest degradation	695	108	6	4	0	813	95.6
3.	Water degradation	665	132	0	0	0	792	93.7
4.	biodiversity loss	740	76	0	6	-	840	98.8

Source: Field Survey, (2019). Note: 5= Strongly Agree, 4= Agree, 3= Undecided, 2= Disagree, 1= Strongly Disagree, Maximum score ( $5 \times 170$ ) = 850

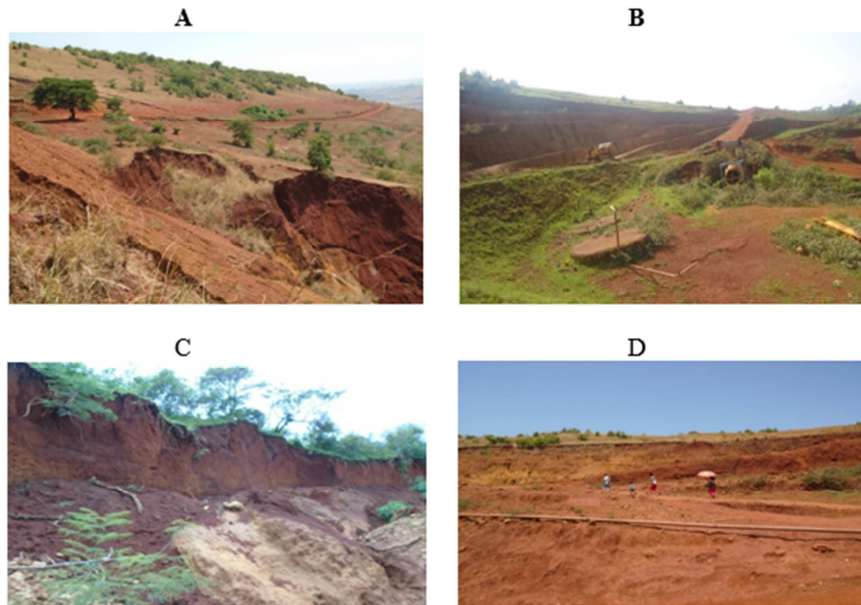
Respondents were asked to identify the degree to which mining has impacted the bio-physical environments (land, forest, water and biodiversity) in the study area. As shown in the table 1, majority of the respondents strongly agreed to the view that mining practice has negatively impacted the bio-physical environment of the study area. The impacted ranked 98.8%, 96.4%, 95.6% and 93.7% for biodiversity loss, land degradation, forest degradation and water degradation respectively. As shown in the figures 2 and 3, this result clarifies the researcher's personal observation of surface mining which has posed a serious risk and change to the bio-physical environment of the study area. Large hectare of land has resulted in serious land degradation that led to a massive loss of large vegetation and forest cover. Mining activities

which have been operated in Yubdo have seriously impacted the land resources such as forests (flora), and biodiversity by changing species composition and structure of the ecosystem. It exacerbated land degradation and decreased the growth of forests resources of the study area. The surface mining changed the landscape and made unfavorable condition for the restoration of indigenous vegetation. The destruction of trees and disturbance of the soil surface have resulted habitat loss. Large gullies and pits/trenches/ were created as a result of mining activities. Soil erosion is very common and most rivers and streams have been polluted in the study area. As information obtained from key informants and FGD, destruction of the landscape, loss in vegetation cover, loss in aesthetic beauty, alteration of the water resources, and loss of

biodiversity were the main environmental problems associated to mining activities.

In line with this finding, the depletion and pollution of water resources, land disturbances and sever soil erosion, vegetation and biodiversity losses resulted from traditional gold mining [14]. Water resources degradation is the most serious environment and social impact which resulted from

mining company in Legadembi gold mining of Mormora River and other streams [35]. Mining activities deplete environmental resources such as water, soil, the landscape, vegetation, the ecosystem, among others. Mining activities have resulted in degradation of environmental resources, such as water, soil, the landscape, vegetation, ecosystem and aquatic life [5, 19, 4, 34].



**Figure 2.** A-D. Land Degradation due to mining in Yubdo district Source: Researcher's own photo, (2019).



**Figure 3.** Artisanal mining in the study area, Source: Researcher's own photo, (2019).

### 3.2. Implication of Mining on Socioeconomic Activities of Yubdo

#### 3.2.1. Positive Effects of Mining on Socio-Economic of Yubdo Area

Table 2 presents the positive impacts of mining on socio-economic such as income generation, employment and infrastructure of the study area.

**Table 2.** Responses of the respondents on impacts mining on socioeconomic environment.

No	Positive impacts of mining	Degree of Agreement					Total score	Percentage of maximum Score
		5	4	3	2	1		
1.	Income generation	0	76	3	96	102	277	32.5
2.	Employment	0	0	12	54	155	221	26
3.	Infrastructures	0	0	9	94	120	223	26.2

Source Field Survey (2019), Note: 5= Strongly Agree, 4= Agree, 3= Undecided, 2= Disagree, 1= Strongly Disagree, Maximum score (5x170) = 850

Respondents were asked whether mining has created conducive socio-economic condition for the community. As

indicated in the Table 2, majority of the respondents strongly disagreed to the assertion that mining activities has not contributed significance socioeconomic development in the study area. The impact ranked 32.5%, 26.2% and 26% for infrastructure development, income generation and employment respectively. According to their response, small scale mining supported only temporarily daily workers and guards from outsiders those were non-indigenous to Yubdo area. It has not increased the income of the surrounding communities through creation of business sectors and market access. The study also found out that Platinum and Gold Mining PLC has not contributed infrastructures (such as roads, schools, water supply, health services, market access and different public services) for the study area. Interview held with key informants and focal group discussion indicated that only small numbers of tentative employments were benefited from the mining company of Yubdo environment. Similar to this finding, small scale mining has not brought local economic development, infrastructure

developments (road networks, educational and health facilities, water and sanitation), employment opportunities, local people's income and creation of local business opportunities [32]. In contrast to this finding, study indicates that small scale gold mining in the West Gonja District of Ghana has contributed positively in improving the lives of the people in the form of employment, revenue generation, and meeting health, education and basic family needs [24].

### 3.2.2. Negative Effects of Mining on Socio-Economic Environments of Yubdo

This sub section presents the negative impacts of social and economic problems associated with mining activity in Yubdo area. As depicted in the Table 3, the negative spinning through social and economic implications include farm land reduction, conflict and violence, physical injuries, death of humans and animals, health problems, displacement and impact on education.

**Table 3.** Responses on negative effects of mining on socio-economic activities.

No	Negative impacts of mining	Degree of Agreement					Total score	Percentage of maximum Score
		5	4	3	2	1		
1.	Farmland reduction	670	136	6	0	0	812	95.5
2.	Conflict and violence	725	84	6	4	0	819	96.3
3.	Physical injury	695	120	3	0	0	818	96.2
4	Death of human	810	20	3	4	0	837	98.4
5	Death of animals	795	28	9	2	0	834	98.1
6	Health problem	405	100	189	2	0	696	81.8
7	Community displacement	490	200	66	0	0	756	88.9
8	Impact on education	795	44	0	0	0	839	98.7

Source Field Survey (2019), Note: 5= Strongly Agree, 4= Agree, 3= Undecided, 2= Disagree, 1= Strongly Disagree, Maximum score (5x170) = 850

#### (i). Farm Land Reduction

As indicated in the table 3, majority of the respondents strongly agreed to the view that mining practices has negatively impacted the farmland of the study area. The degree of impact ranked for farmland reduction is 95.5%. Mining activity in the study area removed the top soil which is needed for agricultural production. It changed the landscape of Yubdo area by reducing farmland and grazing lands. It posed the soil surface and created deep gullies which are expanding to farm lands. During the field visit, it was observed that large hectares of land which is used for agriculture were lost. In support of this finding, study indicates that a large proportion of the respondents lost their agricultural land (mainly grazing land) because of increased mining activities, although the loss of land did not affect production resulting in reduced crop yields and poor living standards [26]. Mining pits, poor rehabilitation and large-scale mining have caused a loss of agricultural land resulting in reduced crop yields and increased poverty [40].

#### (ii). Conflict and Violence

The researcher sought to find out whether mining activity resulted conflicts in the study area. As shown in the Table 3, majority of them strongly agreed to the view that mining practices in the Yubdo districts has caused conflicts among

the communities. The impact ranked for social conflict is 96.3%. Conflicts were caused from the negative impacts associated with physical and socio-economic problems. Conflicts between communities and mining operators over land use rights are common in many regions worldwide and can become a serious threat to development and security [15, 25]. Surface mining, appears to displace farmers, thereby triggering increased deforestation, agricultural intensification, and land degradation [39].

#### (iii). Physical Injuries and Death of Human

Regarding injuries and accidental death, the respondents were asked whether mining activity in the study area negatively impacted humans. As indicated in the table 3, a significant proportion of the respondents, strongly agreed to the view that, mining practices led to physical injury and death of humans respectively. The degree of impact ranked for physical injury and death of human were 96.2% and 98.2% respectively. People frequently get injured and died when failed in to the open pits. During the field work of the researcher, as depicted in figure 3, several disabled people were observed in the study area. Focus group discussion and interview with key informants also indicated that several children were failed in to the large gullies and lost their life. In support of this study, young workers on artisanal mining



were exposed to injuries due to poor social condition, unsuitable landscapes, poor health and occupational safety issues, absence of health insurance, absence of safety equipment, using outdated and obsolete tools and exposure to injuries [21]. Hazardous working conditions in stone quarrying (mining) and cobble chiseling works are exposed to a high incidence accidents and fatal death [41]. Rock fall, subsistence, lack of ventilation, misuse of explosive, lack of knowledge, lack of training obsolete and poorly maintained equipment are the five most frequently cited causes of accident in small-scale mining [16].



**Figure 4.** Man failed in open pit, Source: (Own photo, 2019).

#### **(iv). Effect on Livestock**

Considering the impacts of mining on livestock, respondents were asked to view out their idea. As indicated in table 3, majority of them strongly agreed that various livestock have been trapped and exposed to death by open pits resulted from mining activity in the study area. The degree of impact ranked was 98.1%. Focus group discussion with elders and interview stated that trenches, open pits and large gullies have negatively impacted many livestock in the study area. Studies show that mining led to increase livestock loss by reducing grazing lands [7]. Mining has strong and positive association with the mortality of small ruminant livestock - goats and sheep and a negative association between mining and the mortality of large livestock - cattle, horses, and camels [38]. Domestic and wild animals were affected by abandoned pits that imperiled the area surrounded by mining sites [17].

#### **(v). Health Effects**

Health can be defined as a state of complete physical, mental and social well-being of an individual, and not merely the absence of and infirmity [40]. The respondents were asked the impact of mining practices on issues of health. Majority of them strongly agreed that the diseases suffered from mining practices. The degree of impact ranked was 81.8%. Mining activities results the diseases endemic in their communities as shown in Table 3. As discussion held with Yubdo health workers, high prevalence of aquatic febrile illness (malaria and Typhoid fever) in the area is attributed to mosquito breeding from collected polluted water courses, other stagnant waters collected in holes and pits that are created as a result of mining activities. The interview also indicates that, skin diseases (onko ceirisis) may have resulted from vector flies which dominate around the course of Birbir River. Long time spending in the water results skin diseases (rush). It was predominantly noted that prevalence of skin diseases was largely due to vector flies in the study area.

The prevalence of water born (diarrhea and intestinal parasites) diseases frequently contracted by the respondents. These diseases have resulted from drinking of polluted water during mining operation. From the survey HIV/AIDS and some respiratory diseases encountered resulted from mining operation in the study area. But as interview held with Yubdo health station, there was no sufficient evidence whether respiratory diseases are resulted from mining activities since its investigation requires specialist professional.

All situations recorded from respondents in the sampled communities were compared with patient data obtained from Yubdo health station. The top five diseases taken from Yubdo health station OPD attendance sheet were aquatic febrile illness, neglected tropical skin diseases (onko and dermatitis), diarrhea, intestinal parasites and emphatic filiriasis. It is evident from the records of the health station that malaria, neglected tropical skin disease (onko cercis and dermatitis), diarrhea, intestinal parasites, and emphatic filarisis were the top five diseases recorded up to the present day. In line with this study, various health problems such as body pains, skin diseases, waterborne diseases, sexually transmitted diseases, cold, flu, typhoid, respiratory diseases are major diseases associated with mining activities [18, 13, 12, 2].



**Figure 5.** Interview held with Yubdo Health Station, Source: (Own photo, 2019).

#### **(vi). Displacement**

Displacement was a common problem in the study area. The mining practices of the study area displaced people from their home as well as from their land. As indicated in the table 3, majority of the respondents strongly agreed to the view that mining practices displaced people. The degree of impact ranked 88.9%. Interview held with the communities indicates that mining practices of the study area relocated the surrounding communities from their land. According to study shows that mining has led to the displacement of local people from their lands and result in marginalization and oppression of low income classes [22]. As indicated by Terminski, B., the mining of gold, coal, copper, iron, bauxite and diamond are the mining induced displacement in some African countries like Ghana, Mali, Mozambique, South Africa, Zimbabwe, Botswana, Democratic Republic of Congo, Kenya, Zambia and Tanzania [36].

#### **(vii). Impacts on Education**

As displayed in the table 3, majority of the respondents strongly agreed to the view that mining activities has negatively impacted the school children on education. The degree of impact ranked is 98.7%. The indicator regarding to this idea is that the students to drop out the school and follow mining practices and they do not complete their education. According to interview held with one knowledgeable resident in the study area, most students drop out the school and turn to mining practices. In support of present study, Tesfaye stated that artisanal gold miners in the Menge Woreda of Benishangul Gumuz Regional State cause the boys for school dropout and class repetition during pick time of gold extraction [37]. The study conducted by Chala Wata Deresa, Dharmendra Kumar Dube and Shashi Kant shows that on average large family size has a very poor educational status in Robi Magadda mining area of West Guji Zone, in Oromia Regional State of Ethiopia [11]. Illegal mining activities partake by the students do have negative effect on school attendance and academic performance in Upper Denkyira West District of Ghana [3, 33]. Poverty, peer influence, children's desire to quickly gain economic freedom, poor performance or poor educational results of children and inadequate educational infrastructure and logistics are major factors which pulls or pushes many school children in to mining activity [6].

## **4. Conclusion and Recommendations**

### **4.1. Conclusion**

The purpose of this study was to examine mining practices and its implication on physical and socio-economic environment of Yubdo district, West Wollega Zone, Ethiopia. The major finding of the study shows that mining practices of the study area degraded the bio-physical environments (soil, forest, water, and forest and biodiversity). It seriously impacted the land resources such as forests (flora), and biodiversity and changed the species composition and

structure of the ecosystem. It has led the soil to erosion and most of rivers and streams have been polluted. Most of impacted areas were left without rehabilitation and unsuitable for production. The economic and social conditions of the surrounding communities were not improved. Mining practices has not contributed infrastructures development such as roads, schools, water supply, health services, market access, and different public services. Private sectors like Small Scale Platinum and Gold PLC mining have not contributed any significant economic and social development to the local community. Farmland reduction, conflict and violence, injuries, death of humans and animals, health effects, displacement and impact on education are problems associated with mining practices of the study area. The study concludes that mining practice of the study area has negatively impacted the physical and socioeconomic environment of Yubdo district.

### **4.2. Recommendations**

Based on finding, the study recommends that there is a need to enforce the environmental regulations and laws so as to mitigate the impacted area. It is also recommended that mining practices should be formalized to improve socio-economic condition of the study area. Awareness about environmental sanitation and personal hygiene is very important to prevent diseases associated with mining practices. The integration and collaboration of different stakeholders such as the local communities, government, private sectors and NGO is very important to make mining practices more sustainable in the study area. Finally this study is only concentrated on impacts of mining on physical and socio-economic environments of Yubdo district. Therefore, further studies should be done to investigate the impacts of mining activities on chemical properties of the soil, flora, fauna and water resource of the study area.

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