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The Environmental and Socio-Economic Impacts of Mining on Local Livelihoods In Sierra Leone: A Case Study of Tonkolili District

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ABSTRACT

This paper empirically investigates the socio-economic and environmental impacts of mining in Tonkolili District, Sierra Leone. In addition to sampling community perceptions of mining activities, the study prescribes interventions that can assist in mitigating the negative impacts of mining. Marked environmental and interrelated socio-economic improvements can be achieved within regional artisanal diamond and gold mines if the government provides technical support to local operators, regulations are improved, and illegal mining activity is reduced.

Keywords: *Mining activities, Socio-economic, Local people, mining, Tonkolili District, Sierra Leone*

INTRODUCTION

Mining is a major economic activity in many developing countries (Tauli-Corpuz V., 1997; UNEP, 1997) Operations, whether small or large-scale, are inherently disruptive to the environment (Chernor Momodu Bah, 2016), producing enormous quantities of waste that can have deleterious impacts for decades (UNEP, 1997). The environmental deterioration caused by mining occurs mainly as a result of inappropriate and wasteful working practices and rehabilitation measures.

Mining has a number of common stages or activities, each of which has potentially-adverse impacts on the natural environment, society and cultural heritage, the health and safety of mine workers, and communities based in close proximity to operations (Moody R, Panos SP., 1997; Akabzaa TM., 2000). As indicated by Noronha (Noronha L., 2001), the social and environmental impacts are more pervasive in regions where operations are newly established or are closing down. Several authors (Tauli-Corpuz V., 1997; Filer C., 1998) have commented on the potentially-adverse impacts of mining, which include displacement of local people from ancestral lands, marginalization, and oppression of people belonging to lower economic classes. According to DeLong and Williamson (1994), the observation that resource-poor countries sometimes outperform resource-rich countries is nothing new in economic history. Experience seems to indicate that it is not so much the existence of natural resources per se that hurts growth but rather the failure of public authorities to meet the policy challenge posed by natural resource abundance and to correct institutional and market failures that cause the damage. Owing to this fact, recent research has added an interesting dimension to the literature. According to this research, the association between resource abundance and local livelihood can be explained by its impact on the socio-economic environment. That is, developing nations with great abundance of natural resources are not doomed to failure or poor economic performance if they have strong environmental protection and viable socio-economic activities. According to (Mehlum et al., 2006; Bulte and Damania, 2008), countries or regions with institutions to guard against environmental degradation are, thus, unlikely to be impacted by the curse of natural resources. We will therefore complement the literature by examining empirically the environmental and socio-economic impact of mining on local livelihood in Sierra Leone.

Sierra Leone is one of the countries richly endowed with abundant natural resources in the

world. Such resources include diamonds, gold, rutile, bauxite, platinum, iron ore, fish, etc. The country was in 2010, the world's 10th largest producer of diamonds (2010 Minerals Yearbook Sierra Leone) while earlier on, in 2007, the country was the 7th largest producer of diamonds in the world. Although best-known for diamonds, Sierra Leone is also the world's third largest producer of rutile. Furthermore, according to Africa Minerals Limited (AML), the country, the Tonkolili project to be specific, was confirmed to have one of the largest iron ore deposits in the world. In addition to this, Sierra Leone's coastal waters are known to have the largest numbers of fish as well as the largest species of fish in West Africa.

Although the exploitation of mineral resources is now considered to be one of the chief causes of pollution and environmental degradation in Sierra Leone, there is growing realization that mining activities can be undertaken in a fashion whereby economic contributions are maximized, social conditions are improved, and damages to the environment are minimized. The majority of the country's mining ventures are involved in the extraction of iron ore and other minerals in the Sierra Rutile and Tonkolili Districts. Despite the widespread documentation of increased mineral production within these regions, minimal analysis has been undertaken to determine the impacts associated with the expansion of activities. The findings of this work would therefore complement those by other researchers and government in the formulation of policy with regards natural resources and local livelihood.

METHODOLOGY

Objectives

In a case study of the Tonkolili District, the present study sought to determine the severity of the Sierra Leone mining industry's environmental and socio-economic impacts. The specific objectives of the study are as follows:

- To identify and assess socio-economic activities which are significantly influenced by mining activities.
- To examine local communities perceptions on how mining activities impact the environment.
- To suggest interventions that can assist in mitigating the negative impacts of mining.

This study was based upon the following hypotheses: 1) that mining activities have significant socio-economic impacts on livelihoods of local communities; 2) that regional activities also have significant impacts on the environment; and 3) the type and nature of mining activities have diverse impacts.

Description of the Study Area

The district comprises eleven chiefdoms, with Magburaka as the capital, and Mile 91, the commercial center. Tonkolili is strategically located in the center of Sierra Leone, and is crossed by many rivers including the Pampana River and Sierra Leone's longest river; the Rokel.[1]The district has both highlands and lowlands. The highlands rise up to 700 feet, and are the highest in Sambaia Bendugu chiefdom. It is from these hills that the major rivers in the district have their sources. The rest of the district is lowland which occupies a greater part of the district and is appropriate for rice production.[2] In the past, the district was covered with thick forests, but due to increased farming and mining activities, and the use of slash and burn methods of cultivation, the forests have gradually given way to grass lands. Tonkolili has two major industries: The Magbass sugar complex, which produces sugar and ethanol, and the Gari factory at Robinke, which processes cassava. There are other small-scale industries such as tailoring, carpentry, weaving, blacksmithing, gara tie-dye and soap making. Roads in this region are particularly poor, as is access to markets.[3]

Data Collection and Analysis

Data for the case study were obtained from both primary and secondary sources. Primary data were obtained using a combination of methods, including participatory rural appraisal (PRA) tools and techniques, participant observations, and informal and formal surveys. Pair-wise ranking was first performed to help identify problems caused by mining activities as experienced by the local people in the study area, and to rank socio-economic activities based upon their contribution to household livelihood. Frequencies, percentages and means are used in the discussion. Analysis of variance (ANOVA) and cross tabulations involving chi-square tests were used to test statistical

[1] https://en.wikipedia.org/wiki/Tonkolili_District.
[2] http://tonkolili.com/ourlocation.php.
[3] http://tonkolili.com/ourlocation.php.

differences in various variables between mining and non-mining communities.

RESULTS AND DISCUSSION

Socio-Economic Characteristic of Respondents

Table 1 details the proportion of males and females interviewed during the survey. There was no significant difference in gender within surveyed mining and non-mining communities ($p > 0.05$). Only 25% of the workers in mine camps were females (Table 2), likely because mining jobs are gender-oriented, demanding the services of more males than females. Mining and non-mining communities exhibited minimal difference in terms of average household size: the average household size was 6.6 and 6.5 people within the surveyed mining and non-mining communities, respectively. Surveyed areas likely have comparatively higher household sizes because of the existence of the mining activities, which precipitate population growth through migration.

Table1. *Socio-economic characteristic of respondents in this survey*

Variable	Community status		Total	$\chi 2$ –Value
	Mining community (n=74)	Non-mining community (n=74)	(n=148)	
Gender				0.157
Male	62 (83.8)	55 (74.3)	117 (79.1)	
Female	12 (16.2)	19 (25.7)	31 (20.9)	
Householdsize				0.942
1-4	12 (16.2)	13 (17.6)	25 (16.9)	
5-7	26 (35.1)	26 (35.1)	52 (31.1)	
8-10	23 (31.1)	20 (27.0)	43 (29.1)	
>10	13 (17.6)	15 (20.3)	28 (18.9)	

Figures in parentheses are percentages and those out of parentheses are frequencies.

Within the surveyed area, respondents reported to be involved in diverse economic activities, including agriculture, mining, subsistence business activities, and livestock rearing (Table 3). Some 33.8% of respondents in mining communities reported to be engaged in mining as a primary occupation. Large proportions of respondents (47.3% and 67.6% in mining and non-mining communities, respectively) were engaged in agriculture. Traditionally, local people made their living from agriculture, fishing, hunting and livestock management.

Artisanal mining has a long history in the mineral-rich areas of Tonkolili. As the industry developed, it became the main source of income, attracting not only locals but also individuals from other regions. Some local people are driven to mine because of poor crop harvests-themselves the product of unfavorable weather conditions and/or to supplement household income following the end of the agricultural season.

It was indicated that poor mining methods are the main reason behind unpredictable mineral recovery, which is why many locals have elected to take up agriculture as a profession.

Pits and underground excavations, which are commonly associated with high risks and accidents, are also discouraging many people from participating in mining directly. Generally, it was found that mining was not the major economic activity of the local people in Tonkolili District but rather a complimentary source of income (Tables 4 and 5).

Table2. *Characteristics of mine employees interviewed*

Variable	Community status		Total	$\chi 2$ –Value
	Mining community (n=84)	Non-mining community (n=12)	(n=96)	
Gender				0.050*
Male	63 (75.0)	12 (100.0)	75 (78.1)	
Female	21 (25.0)	….	21 (21.9)	
Age category				0.027*
<18	12 (15.2)	….	12 (12.5)	
18-30	18 (22.8)	10 (58.8)	28 (29.2)	
31-43	30 (38.0)	4 (23.5)	34 (35.4)	
44-56	13 (16.5)	3 (17.6)	16 (16.7)	
>56	6 (7.6)	….	6 (6.3)	

*Figures in parentheses are percentages and those out of parentheses are frequencies.*Significant at p<0.05.*

Table3. *Socio-economic activities of the respondents*

Variable	Community status		Total	χ2 –Value
	Mining community(n=74)	Non-mining community (n=74)	(n=148)	
Main occupation				
Agriculture	35 (47.3)	50 (67.6)	85 (57.4)	0.013*
Mining	25 (33.8)	….	25 (16.9)	0.000***
Petty business	7 (9.5)	13 (17.6)	20 (13.5)	0.355
Agriculture and mining	1 (1.4)	….	1 (0.7)	….
Agriculture and livestock	2 (2.7)	8 (10.8)	10 (6.8)	0.049*
Charcoal dealer	….	2 (2.7)	2 (1.4)	
Government employee	3 (4.1)	….	3 (2.0)	
Construction works	….	1 (1.4)	1 (0.7)	
Agriculture and petty business	1 (1.4)	….	1 (0.7)	

Figures in parentheses are percentages and those out of parentheses are frequencies.

****Significant at P<0.001, **Significant at P<0.01*

In Tonkolili District, the dominant indigenous tribe is the Temne group, which comprises mainly socio-cultural agro-pastoralists. The results in Table 3 indicate that 2.7% and 10.8% of respondents in mining and non-mining communities, respectively, are agro-pastoralists (p<0.05). However, it was frequently observed that mine pits contributed to an abandoning of agro-pastoral systems in mining communities, findings which suggest that mining activities have a negative socio-cultural impact on the livelihoods of local people.

Table4. *Pair-wise ranking of socio-economic activities in mining communities*

Socio-economic activities	1	2	3	4	5	6	7	Rank
1 Mining	(1)							2nd
2 Farming	1	(1)						3rd
3 Farming and livestock keeping	1	2	(1)					4th
4 Charcoaling	1	2	3	(1)				5th
5 Petty business	5	5	5	5	(1)			1st
6 Motor Bike transport services	1	2	3	4	5	(1)		6th
7 Water selling	1	2	3	4	5	6	(1)	7th
Frequency	5	4	3	2	6	1	0	

Table5. *Pair-wise ranking of socio-economic activities in non-mining communities*

Socio-economic activities	1	2	3	4	5	6	7	Rank
1 Farming and livestock keeping	(1)							2nd
2 Lumbering	1	(1)						3rd
3 Charcoaling	1	3	(1)					4th
4 Farming	4	4	4	(1)				5th
5 Selling food crops	1	5	5	4	(1)			1st
6 Motor Bike transport services	6	6	6	4	5	(1)		6th
7 Employment in Tonkolili Gold Mine	7	7	7	4	7	7	(1)	7th
Frequency	3	0	1	6	3	3	5	

Impact of Mining on The Livelihoods of Local People

The evidence from Table 6 indicates that approximately 93% and 80% of respondents in mining and non-mining communities, respectively, benefit differently from the existence of mining activities (p<0.001). Within mining areas, some 42% of respondents benefit from sources of mining employment; 20.3% from improved road networks, water and school construction; 11% from food crop sales; and 8.1% from subsistence (petty) business. It was found that only 8.1% of respondents in non-mining areas benefit from direct mining activities as a source of alternative employment, while 37.8% benefit indirectly from food crop

sales, and 25.7% from subsistence (petty) business. The results indicate that mining activities have created a multitude of income opportunities for the inhabitants of Tonkolili District. There were significant differences in the benefits provided by the large-scale Tonkolili Gold Mine Company to mining and non-mining area in terms of improved roads and water services ($p<0.001$); specifically, non-mining communities appear to be more neglected than mining communities. The findings are supported by IDRC[4] which portrayed mining communities as the beneficiaries of a wide range of new services, including improved access to education and health services.

Table6. *Surveyed perspectives on household benefits from mining activities*

Variable	Community status		Total	$\chi 2$ – Value
	Mining community (n=74)	Non-mining community (n=74)	(n=148)	
Type of benefits				
Selling food crops	8 (10.8)	28 (37.8)	36 (24.3)	0.000***
Employment	31 (41.9)	6 (8.1)	37 (25.0)	0.000***
Petty business	6 (8.1)	19 (25.7)	25 (16.9)	0.004**
Improved road network, water and school construction	*15 (20.3)*	….	*15 (10.1)*	*0.000****
Employment and markets for crops	6 (8.1)	1 (1.4)	7 (4.7)	
No benefit	5 (6.8)	15 (20.3)	24 (16.2)	

*Figures in parentheses are percentages and those out of parentheses are frequencies. ***Significant at P<0.001.*

The presence of mining activities in Tonkolili District has created market opportunities for local farmers. As indicated in Table 6, approximately 11% and 38% of respondents in mining and non-mining communities, respectively, secure markets for their agricultural crops through their mining activities. Within surveyed mining communities, the average annual income earned from agriculture was reported to be Le 662.4, compared to Le 2,687.9 in the non-mining areas surveyed.

[4] IDRC. Mining and the community. !http://www.idrc.ca/ researchO; February 1998.

The influx of newcomers in search of employment at mine sites has increased demand for goods, thus improving opportunities for local people to sell their food crops. The market for agricultural crops may also explain why 47.3% of respondents indicated having a dependency on agriculture, while only 34% of local people interviewed near to mine centers reported being engaged directly in mining activities as a major source of income.

The findings imply that mining significantly contributes to the incomes of local people employed in agriculture by providing markets to their agricultural products.

Table7. *Contribution of economic activities to total household annual income*

Source of income	Mining community		Non-mining community	
	Average income Le	(%)	Average income Le	(%)
Agriculture	662.4	16.17	2,691.67	74.99
Mining	2,687.9	66.18	112.8	3.14
Other activities	723.15	17.65	785.01	21.87
Total	4,073.45	100	3589.495	100

Contribution of Mining to Local Income

An analysis on income from agriculture and mining indicated that in mining and non-mining communities, respectively, average household income from mining was Le 2,687.9 and Le 112.8 and Le 662.4 and Le 2,691.67 from agriculture.

As shown in Table 7, a complementary relationship exists between agriculture and mining within the study areas. Approximately 66% and 3% of average household income in mining and non-mining communities, respectively, is derived from mining. On the other hand, agriculture contributes 16% and 75% to total household income in surveyed mining and non-mining regions, respectively.

The results suggest that while local people employed in mining obtain direct income as mining wages, non-miners increase their income through different socioeconomic activities, including sales from food crops and menial business activities. These results parallel those from other ASM regions, such as those within Bolivia, where McMahon and Remy (2001) report that wages earned by employees at mining operations are spent on goods and services produced by local people, which, in turn, increases the incomes of local populations.

At the national level, figures indicate a contribution of less than 5% to total GDP of the country, meaning that, the industry has not yet significantly increased sustainable income since the enactment of the misneral policy.

RECOMMENDATIONS

Mining practices have already caused serious social and environmental impacts in some mining areas in Sierra Leone, including Tonkolili District.

These problems include land degradation, damage to water quality, pollution, and harm to livestock and wildlife biodiversity.

Although there is growing awareness of the importance of sound environmental management amongst mining stakeholders and Government officials in Sierra Leone, mitigation strategies are possibly offset by conflicts of interest on both political and economic grounds at central and local levels. To address the impacts of mining:

- The government should aim at providing technical support to local mine stakeholders such as training in facilitation and management tasks to local stakeholders. New technology has to be developed that uses fewer chemicals during extraction and processing, and mine waste should be regulated and turned into a non-harmful form before it is discharged to waste ponds.
- It has to be mandatory for all mining activities taking place in Sierra Leone, at both a large- and small-scale, to submit environmental impact assessment reports before a license to mine or explore can be granted. Improved regulations and independent monitoring teams should be commissioned to intervene before environmental and social problems spiral out of control.
- Strategies to eliminate illegal mining and to promote other income-generating activities like agriculture and agro small-scale industries may reduce pressures on mining, thus helping to improve the social, economic and environment management of natural resources.

CONCLUDING REMARKS

This paper has examined the socio-economic and associated environmental impacts of small-scale mining in Tonkolili District, Sierra Leone. Despite not being a primary economic occupation for the majority of the region's local people, mining does nevertheless provide essential supplementary income. In terms of environmental impacts, the perception shared within local communities is that mining has caused land degradation.

Mine pits have clearly prevented farmers from harvesting animal manures, and excessive vibrations caused by repeated explosions have resulted in the cracking and collapsing of buildings near to mine sites.

Policy changes and global influences have increased large-scale mining activities in Sierra Leone, creating clashes of interest between foreign and local parties.

The impact of these changes has restricted small-scale miners, who depend on gold rush conditions for subsistence, from advancing and improving their livelihoods.

REFERENCES

[1] Tauli-Corpuz V. (1997).The globalization of mining and its impact and challenges for women!http://www.twnside.org.sg/bookstore.htmO UNEP (1997).
[2] Industry and environment, mining and sustainable development.
[3] !http://www.uneptie.org/vol20no4.htmO
[4] Chernor Momodu Bah (2016), Economic Growth, Institutions, and the Natural Resource Curse in Sierra Leone: an Empirical Investigation, International Journal of Business and Social Science, 7(5), 100-124.
[5] Moody R, Panos SP. (1997), .Environmental assessment of mining projects.
[6] !http://www.worldbank.org/mining.xlsO;Akabzaa TM. (2000).Boom and dislocation. The environmental and social impacts of mining in the Wassa West District of Ghana.
[7] Accra, Third World Network e Africa Noronha L. (2001), Designing tools to track health and well being in mining regions of India.
[8] Natural Resource Forum 25:53e65.
[9] Filer C. (1998) .Mining in the South Pacific. !http://www.antenna.nl/ecsiep/bulletin.htmlO;
[10] DeLong, J. B., and Williamson, J. G. (1994). Natural Resources and Convergence, In: The Nineteenth and Twentieth Centuries, Unpublished paper, Harvard UniversityMehlum, Halvor, Karl Moene, and Ragnar Torvik. (2006).
[11] Institutions and the Resource Curse.Economic Journal 116 (January): 1–

20IDRC. Mining and the community. !http://www.idrc.ca/ researchO; February 1998.

[12] McMahon G, Remy F, editors. (2001) Large mines and the community: socio-economic and environmental effects in Latin America, Canada, and Spain. Ottawa: International Development Research Centre; p. 335.

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