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Effects of mining activities on access to potable water: households' perception and practices at Konongo and Odumasi communities in Ghana.

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Abstract

This research work adds to the knowledge the academic community and policy makers have about mining activities as not only contributing to socioeconomic development but also capable of causing problems. Specifically, it looks at how mining activities affect water resources and hence water access in the mining communities of Konongo and Odumasi based on the perception, opinions and practices of selected households. Through the use of the fish bowl probability sampling, a total of 107 households were selected from the mining communities of Konongo and Odumasi to respond to interviews. Institutions such as the Environmental Protection Agency (EPA), Owere Mines Limited (OML) and Asante Akyem North Municipal Assembly (AANMA) were purposively sampled for relevant information for the study. The study revealed that people's perception and opinion about the state of the Owere and Agogowa streams as being made dirty by mining activities has caused less utilisation of such streams. Households have coped with mining related problems by resorting to the use of pipe borne and hand dug well waters. With these mechanisms households have coped well with mining activities and mining related problems. It is recommended that the OML and AANMA provide alternative sources of drinking water in the form of bore holes and pipe borne water in abundance. These sources should be made accessible and affordable especially to the poor who cannot afford to dig their own wells and also buy pipe borne water.

Keywords: Mining activities, households' perceptions, practices, water access, and coping strategies.

1.0 Introduction

Many human activities such as farming, construction, transportation, communication and space exploration, make use of end product of mining. These operations in one way or the other also use raw materials derived from mining activities. For example many farm implements are made of diamond which is one of the hardest earth materials acquired through mining activities. Also space shafts use fuel which is also an earth material from mining activities (Gregory, 1980).

Besides their high direct contribution to Gross Domestic Product (GDP), mining activities can attract land, capital and labour, all of which are indispensable for industrialisation and economic development, particularly in developing countries. In North America, raw mineral production in 1998 was valued at approximately $70 billion and the industry employed about 1 million people (Mbendi, 2004). Mining is important to South Africa and directly contributed about 6.5 percent of GDP and 33.5 percent of total export revenues in 1999 (Gaven *et al*, 2001).

In Tanzania, the mining sector contributes around 2.3 percent to annual GDP (Tanzania Mining Report Q3, 2009). Diamond mining is the single biggest industry in both Botswana and in Namibia. In Botswana, diamond mining consistently accounts for around 30 percent of GDP and around 80 percent of export earnings (De Beers Group, 2008). According to (Aidara, 2013) mining (particularly gold) has long been Ghana prime export surpassing cocoa (main agricultural product). Minerals export made up to 41% of total merchandised export in 2011 and contributes about 17.5% of Ghana's total corporate tax earnings and 27.6% of government revenue annually.

Despite these immense contributions made by the mining sector, empirical research in some areas have revealed that much harm is being caused by mining activities to the environments within which they take place. The

mining industry has significant and often irreversible impacts (Danielson and Lagos, 2001). Environmental impacts can occur during all the phases of a mining project; exploration, disposal of waste rock and overburden, ore processing and plant operation, tailings (processing wastes) management, infrastructure (access and energy) and construction of camps and towns (Danielson and Lagos, 2001). Barning and Dorgbetor (2002), in their presentation at a conference proceeding stated that mine effluents if discharged untreated into water bodies can cause serious water pollution problems.

The above mentioned problems, thus called for proper investigations to be done into the relationship between mining and households' access to potable water in mining communities. There has been lots of researches on mining activities regarding the effects of mining activities on the chemical content of water resources, households engagement in mining activities, mining and land degradation, mining activities and the structural adjustment programmes without scrupulous attention to how mining activities affect potable water from the perspective of the households. Also the perception households have about the state of water resources in mining communities as well as practices and coping strategies used by mining communities has not much been explored. This research work has been undertaken to fill these gaps.

2.0 Methodology

2.1 Research design

Both quantitative and qualitative data were used in the study. The type of study used was cross-sectional. A cross-sectional survey collects data to make inferences about a population of interest (universe) at one point in time. Cross-sectional surveys have been described as snapshots of the populations about which they gather data (Hall, 2008). This study was therefore a one-shot study on the effects of mining on households' access to potable water. The purpose of this type of study was to obtain an overall picture of the problem at the time of the study.

2.2 Sampling procedure and methods of data collection

For the purpose of this study both the probability and non probability sampling techniques were used. Whereas the fish bowl simple random sampling technique was used in selecting the heads of households, purposive sampling was used to select the officials at the AANMA, OML, and EPA. The basis for the use of purposive sampling was that these were principal actors and they were the only institutions that could provide that information needed for the success of the study.

Sources of data included both primary and secondary sources. Interviews and focus group discussions were used to collect the primary data from the selected communities. The focus group discussion was made up of five participants who were all opinion leaders of the Odumasi community. Officials of OML and other mine workers were interviewed regarding their performance in provision of water for the two communities. There were also interviews with officials of EPA and AANMA. Secondary sources used included information from published theses and scholarly works, journals, standard text books and internet.

2.3 Research participants and study setting

Two mining communities; Konongo and Odumasi in the Asante Akyem North Municipality were selected for the purpose of this study. These study communities are shown in figure 1. The presence of mining activities by the Owere Mines Limited (OML) and the heavy presence of small scale legal and illegal mining activities in these two communities called for their selection. Interviews with household heads within the two communities were used to extract relevant information for this study. In all, a total of 107 household heads were selected from the 1068 households in the Konongo and Odumasi communities. However, 54 and 53 households were selected to respond to structured interviews at Konongo and Odumasi communities respectively. Institutions such as the EPA, AANMA and officials of the OML were also units of analysis of the study.

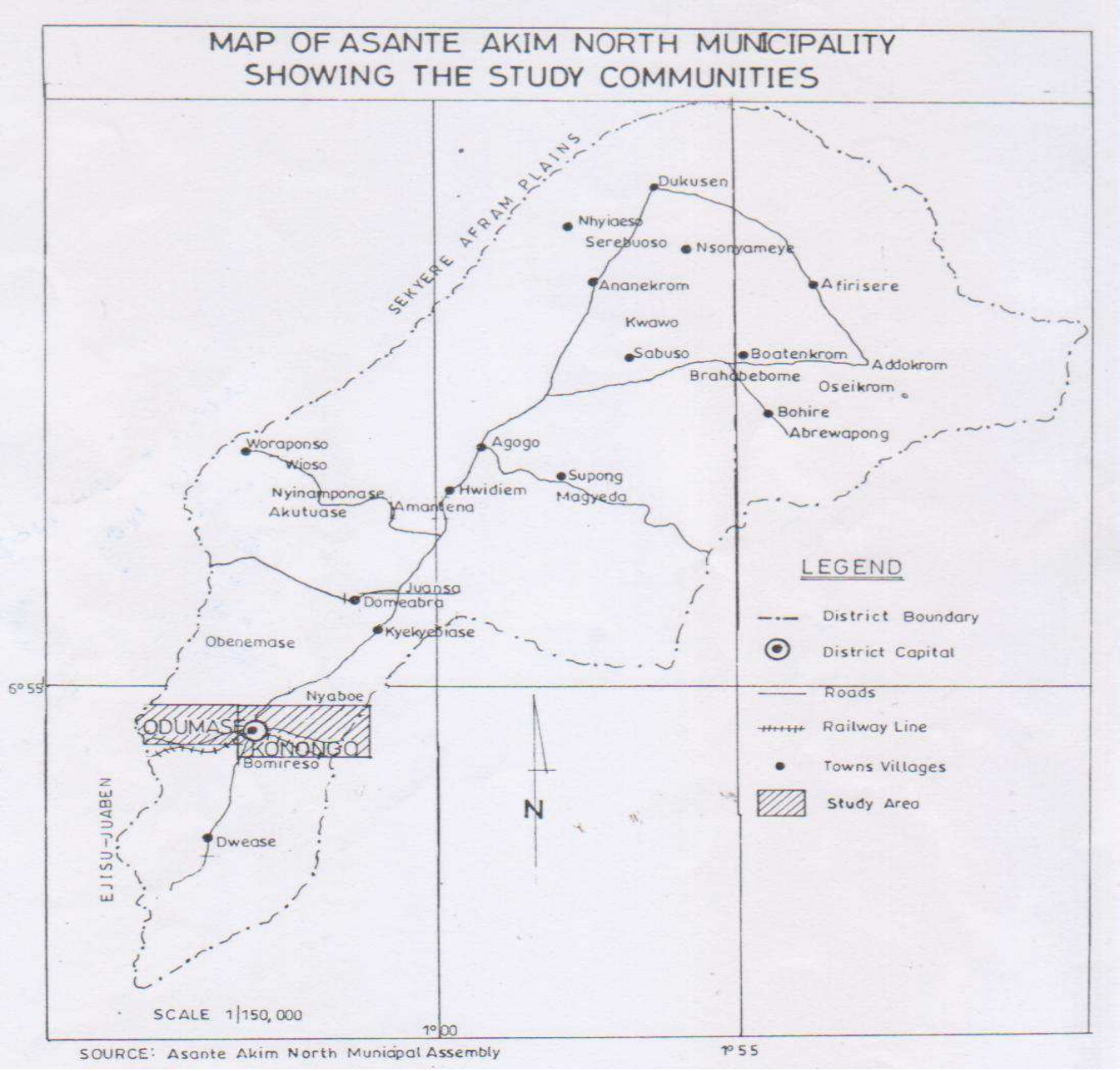

Figure 1: Map showing the Asante Akyem North Municipality and the two study communities

3.0 Results and Discussion

This section consists of presentation and analysis of data as well as the discussions of the results obtained from the selected communities at Konongo and Odumasi on the effects of mining on households' water access. Both quantitative and qualitative data were obtained from households.

3.1 Mining Activities and Water Access

3.1.1 The state of the Owere stream according to household heads:

On the state of the Owere stream, 47.7 percent of the respondents opined the stream is dirty, 21.5 percent also said it is very dirty, 16.8 percent said it is normal. However, 12.1 percent of respondents responded that the

stream is clean whereas, 1.9 percent also believed it is very clean. It could therefore be inferred that these opinions people have about the state of the stream can affect the utilisation of water from the stream. Those who believe the stream is clean might fetch from it and the vice versa.

3.1.2 Residence of respondents and their perception and ideas on the state of the Owere stream.

There were dissenting views on the state of the Owere by Konongo and Odumasi residents. Whereas 2 households at Odumasi responded that the Owere stream is very clean, none of the respondents at Konongo opined that the stream is very clean. Also 13 out of 54 respondents at Konongo were of the view that the Owere stream is very dirty while 10 out of 53 respondents at Odumasi said the stream is very dirty. Again, 26 and 25 respondents at Odumasi and Konongo respectively, believed that the stream is dirty. From the responses given by household heads in the two communities, it is clear that place of residence could affect the people's knowledge, opinion and perception about the state of the Owere stream. For example no household head from Konongo said the stream is very clean but 2 of them from Odumasi said the stream is very clean. Also 13 respondents at Konongo believed that the stream is very dirty whereas at Odumasi it is 10 responded that it is very dirty. These contrasting views could also be a reflection of the people's perception about the extent of contamination of Owere stream in the two communities.

3.1.3 Causes of the poor state of the Owere stream

Among the households (51 representing 47.7 percent) who claim the Owere stream is in its poor state, majority of them representing 69.2 percent attribute it to mining activities, 20.6 percent think it is as a result of crop farming along and near the banks of the stream, 5.6 percent think it is fishing activities and 4.7 percent think other activities that goes on in the stream such as swimming and washing. Based on the responses given, the perception of people has made it clear that mining activities might be the cause of the present state of the Owere stream. Therefore the state of the stream which majority of the household heads (47.7 percent) perceives it to be dirty could be caused by mining activities. Also it could be a reflection of the people's perception about the scale of various activities near the Owere stream in the two mining communities.

3.1.4 Main source(s) of drinking water for respondents

Pipe borne water is the main source of drinking water to the selected households representing 45.8 percent. Significant number of households, that is, 34.6 percent use wells while 19.6 percent use water fetched from streams. This means that majority of the households contacted use pipe borne water. The less utilisation of stream water as compared to the other alternatives could be because of the perception people have about them as being dirty. In an interview with the environmental health officer at the AANMA, it was made known that the Assembly ensures that households have access to potable water through the Government of Ghana's intervention in community water supply. They ensure that pipe borne water and well water is made available to the Konongo and Odumasi communities. In a similar interview with the environmental officer at the Owere Mines Limited it was revealed that the Mine had provided none of the two communities with any alternative source of water, even though it was willing do so if their activities were found to be polluting the Owere stream. An interview with the Ashanti Regional Programmes Officer of the EPA revealed that the EPA obliges the mining companies to solve mining related problems such as provision of water resources if mining activities impact on water resources in the mining communities.

3.1.5 Chance in distance between houses and water sources

From the field survey (2012), for the past 15 years, 82.2 percent (88 households) of the 107 respondents have changed their source of drinking water and now fetch from other sources and hence distances from their houses to the sources of water have also changed. This is a change from the use of stream water to other sources. The rest which constitute 17.8 percent of the respondents have not changed their source of water for the past 15 years. This implies that majority of the households have changed their source of water. Majority of the households fetch from sources which were not their main sources of water sometime ago.

Varying reasons were given by the 82.2 percent of respondents whose sources of water and the distance to their sources of water had changed. That is, for the past 15 years households' distance to their water sources have

changed due to several reasons. From figure 2, 23.9 percent of the respondents whose source of water has changed retorted that, 'Galamsey operators have destroyed the stream close to us', 41 respondents who constitute 46.6 percent of the respondents also believe 'the Owere stream is now unhealthy to drink and for that matter we have stopped fetching from it', 22.7 percent of the household gave reason as 'the Agogowa stream is now dirty for drinking because of mining activities' whereas 6 respondents who constitute 6.8 percent also said 'the pipe borne water is now closer to my house than the stream water which used to be my main source of water'.

From the responses given above, 41 households which constitute about 47 percent of the respondents have changed their main sources of water which were the Owere and the Agogowa streams with their reasons linked to their perception about the effects of mining activities on potable water. Also, the 46.6 percent of the household who believe 'the Owere stream is unhealthy to drink' could be because of the mining activities which have made it so. This result from the field survey is not different from that of Akabzaa and Darimani (2001) as their research brought to fore that majority of households complains of water pollution at Damang within the operational area of Ashanti Goldfields Limited (AGL).

Again, from the responses it could be inferred that mining activities in the two communities have had both direct and indirect effects on water accessibility. The direct impact is explained by the fact that most respondents had the perception that mining activities were the sole cause of the poor state of their streams. Out of the 82.2 percent of households (88 households) who had changed their source of water, 47 percent attributed it directly to mining activities which had made their previous water sources dirty, whereas, the remaining thought otherwise. Because of this perception, people's attention have shifted from the Owere and the Agogowa streams which used to be the main sources of water for households sometime ago. Indeed the study strongly corroborated with the study by Akabzaa and Darimani (2001) as they discovered that the level of pollution of streams at Damang was so serious at one time that AGL had to place security personnel along the banks of these streams to prevent the communities from using them.

The result from field survey (2012) supports the findings of Mate (1998) which brought to fore that mining activities have led to water pollution and that households have resorted to alternative water sources provided by mining companies. From the Authors' field survey in 2012, households' sources of water have changed because of their perception that the streams which used to be their main source of water have been made dirty by mining activities. That is, households at Konongo and Odumasi have also switched to alternative sources of water, this time not provided by mining companies in the area but by the Municipal Assembly at a fee.

Indirectly, mining activities limits people's access to water as they now have to pay a fee in order to access water from an alternative source. In all, 52.1% out of the 82.2% (88 households) of respondents whose source of water has changed confirmed that they pay a fee in order to access water. This result shows that, indirectly, one's ability to access clean water is now determined by his/her ability to pay for it.

The results of the survey also show that the mining activities at Konongo and Odumasi have deprived the people of their one time fresh water. This result is similar to the one found by Action Aid (2006) which shows that effluent discharge from AngloGold Ashanti's (AGA's) Pompora Treatment Plant into the Kwabrafo, a tributary of the Jimi River, has contaminated these rivers and deprived residents of villages and towns such as Sansu, Odumasi, Akofuom, and Jimiso Kakraba that uses water from them of their once-fresh water.

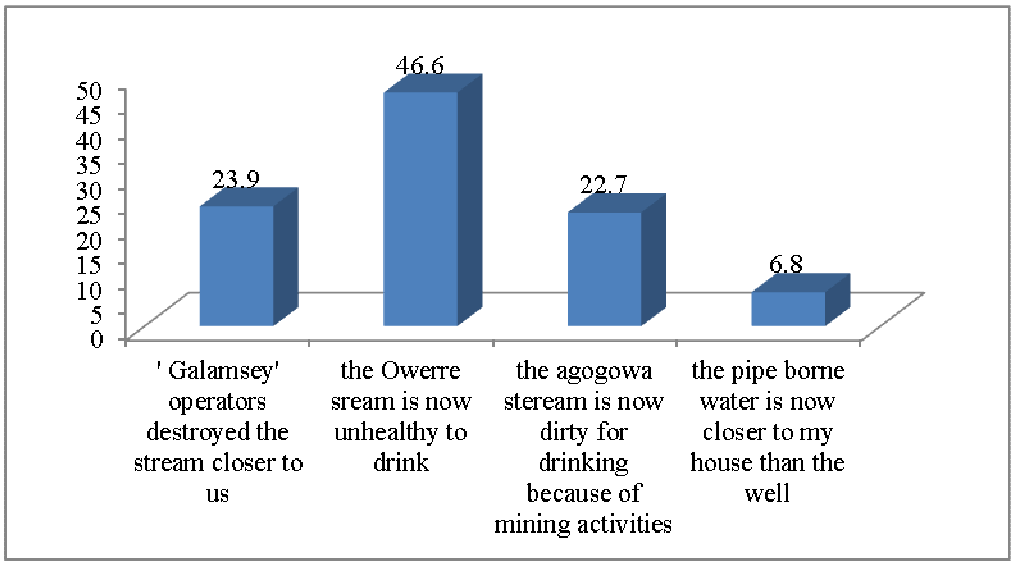

Figure 2: Reasons why households' distance to sources of water have changed

Source: Authors' Fieldwork, 2012.

3.2 Coping Strategies used by Households

3.2.1 Respondents' use of boiled water:

Only 16 percent of the respondents boil water before using it whereas 85 percent of them use water from sources without boiling it. This implies that boiling water is not a major practice in the communities of Konongo and Odumasi. Majority of the respondents believe that they get water from trusted sources which do not need any further treatment. This was expressed mostly by those who use pipe borne water.

3.2.2 Main source(s) of drinking water of respondents and chemicals used:

From table 1, only 10 households use chemicals to treat water. Out of this number of Six (6) households confirmed that they obtain their water from the well. Next to the well users are those who fetch water from pipes and then those who use water from streams. It can be inferred from the result in table 1 that those who use chemical to treat their water are mostly households who fetch water from wells and that the use of chemicals is not a major practice at Konongo and Odumasi.

Table 1: Main source(s) of drinking water of Respondents and chemicals use

Main source(s) of drinking water of Respondents	**Chemicals**			Total
	Hydrogen peroxide	Alum	Chlorine	
Stream	1	1	0	2
pipe borne water	0	1	1	2
Wells	1	1	4	6
Total	2	3	5	10

Source: Authors' Fieldwork, 2012.

Focus group discussion was conducted to delve into how the mining communities were coping with the mining activities. On the problem of water access posed by the mining activities it was found that people now pay for pipe borne water instead of fetching the dirty stream water. For some people, they don't have money to pay for

the pipe borne water and that they will fetch from the stream. Also some of the people in the community have dug wells in their houses. Those who could not afford to dig their own wells also fetch water in houses next to theirs where there are wells.

The opinion leaders opined that switching from fetching the stream water has not been a problem to the community. This according to them is due to the understanding people have gotten regarding the consequences of drinking the dirty stream water. These were the words expressed by the only octogenarian who was among the participants of the focus group discussion:

"……we suffered most from drinking contaminated water. So what should prevent the people from drinking potable pipe borne water if it is available now? In my opinion the skin diseases that befell this community was the result of the poor drinking water and it has reduced since we had access to good drinking water".

4.0 Conclusion

After a thorough research into the problem, it can be concluded that, households have perception that mining activities have contributed to the poor state of the streams in the mining communities.

It can also be concluded that the perception held by households in effect has compelled most of them to stop fetching from the streams and have now switched to alternative sources of water although the stream water has not been scientifically tested at the laboratory.

The research work have revealed that due to the availability of other sources of water, households have not wasted time in switching from fetching stream water to the other sources such as the pipes and wells. Also, people have understood the consequences of fetching from the stream. Pipe borne water and wells are now the main sources of water in the two mining communities. Practices such as boiling water before use and the use of water treatment chemical are not major practices at Konongo and Odumasi communities as few of the households contacted are into such practices.

5.0 Recommendation

- There should be conscious efforts by the Owere Mines Limited as well as the Asante Akyem North Municipal Assembly to provide alternative sources of potable water in the form of bore holes and pipe borne water in abundance. These sources should be made accessible and affordable especially to the poor who cannot afford to dig their own wells or buy from commercial water taps.
- Most importantly, there should be massive education on the health consequences of using water from the streams which according to majority of the respondents perceive are in their bad state.
- Since the problem of inadequate logistics and funds runs across the Assembly and the EPA, all stakeholders such as individuals, government and nongovernmental organisations should contribute their quota towards funding for environmental protection, monitoring, preservation and conservation. Sufficient financial support and technical equipment should be provided for mining and environmental regulatory institutions to ensure effectual monitoring of mining operations around the country in general and at Konongo and Odumasi in particular. This in the long run would ensure quality environmental standard for human habitation in the municipality.
- The existing environmental laws should be reviewed to reinforce their disincentive effect and also to provide for on-the-spot fines for offences such as cyanide and mercury spillage which might occur due to inappropriate technology and the management style of mining companies. This should particularly be done to check the illegal miners who extract and wash gold ore in the Owere and Agogowa streams and also do not have tailings dam where they could manage and treat the waste they generate.
- There should be further study if possible longitudinal study to cross check the long term effects or problems created by mining activities in order to evaluate the actual environmental and health effect of mining activities in the municipality. That is, an intensive and organised study of the area that would help to determine the increasing impact of mining activities. Such a study would provide the baseline data for effective monitoring and sound environmental management practices.

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