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Environmental Impact of Clay Harvesting at Mpraeso Amanfrom in the Kwahu- West Municipal of the Eastern Region of Ghana

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Abstract:

In Ghana, clay is a widely distributed and abundant mineral resource for major industrial and economic importance for a humongous variety of uses. Ghana's commonest and popular way of clay harvesting is by open pit method. Most harvesters usually abandon the harvested site immediately after their harvesting activities without reclaiming it. Therefore the main aim of the study is to find out the environmental impact of clay harvesting at Kwahu Mpraeso Amanfrom in the Kwahu West Municipality of the Eastern Region of Ghana. Ten (10) people each were selected randomly from five sampling sites. This gave a total sample size of fifty (50) for the study. The main instruments used for data collection were structured questionnaire and interviews, and physical observation of site and community base response survey. Statistical Package for Social Sciences (SPSS) was used to analyze the raw data and the results presented using frequency distribution tables. The nearness of the clay harvesting sites to river bodies was major pollution source to the water bodies. It was further realized from the analysis that 90% of the respondents accepted that the harvested lands were not reclaimed. Thematic educational programs should be organized for clay harvesters in the area by the government through the municipal assembly to educate them on the impacts of indiscriminate clay harvesting on the environment so that the clay harvesters become conscious of environmental degradation and its effect. The Environmental Protection Agency (EPA) should intensify their supervisory role at the clay harvesting sites in these areas to curb the menace to the environment

Keywords: clay harvesting, land reclamation, environmental degradation, anthropogenic needs

1. Introduction

Clay is a widely distributed and abundant mineral resource for major industrial and economic importance for a humongous variety of uses (Virta 1991). The use of clay for mainly clay figures, pottery and ceramics was already known by primitive people about 25000 years ago (Shaikh and Wik, 1986). In our modern era clay is now used in an advanced way. According to Murray, (1991) clay is used as adsorbent, decolouration agents, ion exchange, and molecular sieve catalyst. Ghana's commonest and popular way of clay harvesting is by open pit method. According to Ampian (1985) this open-pit methods is done by using various types of equipment, including draglines, power shovels, front-end loaders, backhoes, scraper-loaders, and shale planers. Like many other man-made activities (anthropogenic factors), clay harvesting activities cause significant impact on the environment (Okafor, 2006). Extraction of raw materials from their natural habitats has a consequential effect on the natural environment (Fedra *et al.*, 2005). The effects generated from clay harvesting can be multiple, such as soil erosion, air and water pollution, geo-environmental disasters, loss of biodiversity, and ultimately loss of economic wealth (Williamson and Johnson, 1991).

Clay harvesting like Mining activities remove surface earth, piling it over untilled land and forming chains of external dumps, which one way the other affects the soil nutrient cycle of the area (Wong, 2003 and Sheoran *et al* 2008). Stockpiling of top soil in mounds during mineral extraction has been shown to affect the biological, chemical and physical properties of soil (Harris *et al.*, 1989; Johnson *et al.*, 1991; Davies *et al.*, 1995). According to Singh and Singh (2006) the biological functionality along with the nutrient cycle is disturbed leading to non-functional soil system as a result of low organic matter content and other unfavourable physico-chemical and microbiological characteristics.

According to Davis (1966), mines both active and inactive, are potential water contamination sources and to Freeze and Cherry, (1979) drainage of materials from abandoned pits can act as ground water contamination source for years after mining operations have stopped. Eroded and drained materials could fill and cement water bodies. Runoff after heavy rainfall often increases the sediment load of nearby water bodies. Johnson, (1997) reported that, minimizing the disturbed organic material that ends up in nearby streams or other aquatic ecosystems represents a key challenge at many mines. In addition, clay harvesting like mining activities may modify stream morphology by disrupting channels, diverting stream flows and changing the slope or bank stability of a stream channel. These disturbances can significantly change the characteristics of stream sediments, reducing water quality. To Ripley, (1996) higher sediment concentrations increase the turbidity of natural waters, reducing the light available to aquatic plants for photosynthesis. In addition, increased sediment loads can smother benthic organisms in streams and oceans, eliminating important food sources for predators and decreasing available habitat for fish to migrate and spawn (Johnson, 1997b). Higher sediment loads can also decrease the depth of streams, resulting in greater risk of flooding during times of high stream flow (Mason, 1997).

Land reclamation which according to Powter (2002), refers to as the process of reconvertng disturbed land to its former or other productive uses; has been ignored by clay harvesters in Ghana. Long term mine spoil reclamation requires the establishment of stable nutrient cycles from plant growth and microbial processes (Singh et al., 2002, Lone et al., 2008; Kavamura and Esposito, 2010). Normally mined lands should be reclaimed to support farming and other agricultural activities to the benefit of man. The 1997 American federal Surface Mining Control and Reclamation Act (SMCRA) mentioned that, there should be a better restoration of strip-mined lands, especially where mines replace prime farmland. They outlined that the following could be adopted to reclaim mined exploited lands. They include; Rebuilding soil structure, management of soil pH, increasing soil fertility, re-establishing nutrient cycles, top soil management as well as controlling the influence of soil erosion on reclaiming land. In Ghana most clay harvesters usually abandon the harvested site immediately after their harvesting activities without reclaiming it. Therefore the main aim of the study is to find out the environmental impact of clay harvesting at Kwahu Mpraeso Amanfrom in the Kwahu West Municipality of the Eastern Region of Ghana.

2. Methodology

The research was conducted at Mpraeso Amanfrom in the Kwahu West Municipality of Ghana. Kwahu West Municipal is one of the twenty six Municipalities and Districts in the Eastern region of Ghana. The municipality covers an area of about 414 square kilometres. The municipal capital Nkawkaw is located about 165 kilometres North West of Accra with an estimated population in 2010 about 53,520. In terms of climate, the Municipality lies within the wet-semi equatorial region. As such, it experiences a double maxima rainfall pattern with an average annual rainfall between 1,700mm to 2,000mm is usually recorded. Mean monthly temperature values as high as 30°C is often recorded between the months of March and April but declines to 26°C in August. The municipal is bounded to the north by the Kwahu- South District, to the west by Asante-Akim South District. To the east is bounded by the Fantekwa District and to the South by Birim North and Atiwa Districts. To the Northeast of the municipal capital, Nkawkaw are some of the highest peaks of the Kwahu plateau. The capital, Nkawkaw is situated on the road between Accra and Kumasi, and lies about halfway between these cities. The major occupation of the inhabitants is pottery. This industry engages mostly women who use clay to manufacture products such as pots, earthen wares, cups and some other important items, whereas, others also engage in clay harvesting as a major livelihood. The target population were the residents who engaged in clay harvesting. For the purpose of the study, ten (10) people each were selected randomly from five sampling sites making a sampling size of fifty (50) for the study. The main instruments used for data collection was questionnaire and interviews, and physical observation of site and community base response survey. The results from the study were analyzed with SPSS using descriptive statistics such as frequencies and percentage

3. Results and Discussion

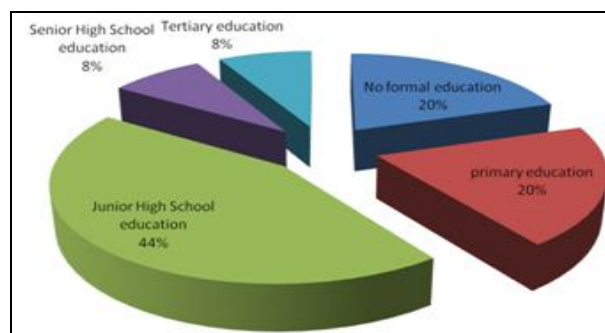


Figure 1

The figure above shows the educational level of the respondent during the study. Even though majority of them had less education but those who claimed to have JHS education could hardly read and write. This suggests that over eighty four percent (84%) of the total respondents were secondary literates and illiterates. Therefore the effects of their activities to the environment and its inhabitants are least known by these harvesters which Sterling (2003) reported that, an ecologically literate society would be a sustainable society which does not destroy the natural environment on which they depend. Then an ecologically illiterate society can consciously or

unconsciously partake in activities that can have adverse effects on the environment. The respondents who had education below SHS could hardly appreciate the effects of the clay harvesting on the ecosystem and thus negatively impact the environment as stressed by Capra (1997), that understanding the principles of organization of ecosystems and their potential application to understanding how to build sustainable human society, combines the sciences of systems and ecology in drawing together elements required to foster learning processes toward a deep appreciation of nature and our role in it. Because of man's direct dependent on their immediate environment it has become a necessity to balance anthropogenic need to the need of controlling the environment. Capra (1995) mentioned that in the coming decades, the survival of humanity will depend on our ecological literacy – our ability to understand the basic principles of ecology and to live accordingly. This means that ecoliteracy must become a critical skill for politicians, business leaders, and professionals in all spheres, and should be the most important part of education at all levels – from primary and secondary schools to colleges, universities, and the continuing education and training of professionals.

Item	Strongly Agree %	Agree %	Disagree %	Strongly Disagree %
Section A				
Some clay harvesting sites closer to water bodies	76	16	6	2
Clay mining activities change the colour of water bodies	72	18	8	2
The EPA officials train the people to harvest clay in such way that the water bodies are unaffected by their activity	8	6	6	80
Section B				
Clay mined lands have been reclaimed	-	10	10	80

Table 1

From section A of table 1; 92% and 90% of the respondents respectfully agreed that clay harvesting sites were closed to water bodies and the colour of water from these water bodies are affected by the harvesters activities. In addition to this 86% of the respondents disagreed that EPA officials had given them training on how to balance their activities with the harvesting in such a way that water bodies are not affected. Clay harvesting either by opencast or by shaft methods has detrimental effects water bodies and thus causes a reduction in the overall water quality in and around the harvesting areas. The major effect of clay harvesting on water bodies is the change of water colour due to the dissolved clay particles in the water. Since clay is made up of different colours such as red, blue-black and grey, water bodies that are affected also assume such colours. Davis, (1966) mentioned that mines, both active and inactive, are potential water contamination sources. Freeze and Cherry, (1979) also added that drainage of materials from abandoned mines can act as ground water contamination source for years after mining operations have stopped. According to the community members, the stock piles gradually drain to the nearby streams after rainfall which is in connotation to what Mason (1997) mentioned. The harvesting sites were closed to water bodies; digging to relatively low depth usually hit the water table and causes underground water to drain into the harvesting pits and overflows to disturb the nearby residence. The streams on the other hand easily dry up during dry seasons as result of reduced volume of underground water. It was realized by Dobb and Edwin, (1996) that groundwater withdrawn from the Santa Cruz river basin in southern Arizona for use at a nearby copper mine is lowering the water table and drying up the river. In effect, harvesting of clay minerals close to water bodies has overwhelming effects on the lives of both plants and animals including humans in and around the locality.

From section B of the table, there is a clear indication that 90% of the respondents believed the harvested lands were not reclaimed while 10% attested that there had been some form of reclamation on the harvested land. Most of the respondents explained that there was no need for any reclamation because such lands are not usually cultivated and that the time for reclamation could be used to harvest a lot of clay. The harvesters' knowledge about land reclamation is contrary to the reports of Alford and Tulay (1974), that environmental hazards posed by mining activities can be reduced by adapting best mining practice such as land reclamation after mining. Because land reclaiming activities such as those outlined by the SMCRA have not been adopted by the harvesters in the area, physical and chemical properties of the soil has been altered completely. Organic manure can be added to reclaiming land to improve the soil physical properties. Tordoff *et al.*, (2000); Jordan *et al.*, (2002), mentioned in their work that an organic amendment can be adopted by adding materials such as woodchips, composted green waste or manure, biosolids, etc to increases the soil pH, improved soil structure, adjust the water holding capacity, improve cation exchange capacity (CEC), provide a slow-release fertilizer and serve as microbial inoculums. Smith *et al.*, (1985) also mentioned that, addition of woodchips to bare soils help increase establishment and growth of plants. At Mpraeso Amanfrom, a vast land on which clay has been harvested has been left unproductive and shows how valuable plots of land have been wasted in the locality. The uncontrolled digging and abandoning of pits can cause destruction of land beyond economic and technical reclamation. Thus, agriculture in this area has been seriously affected as a result of deep clay-harvested pits. This suggests that after the land has been reclaimed, varieties of crops can be cultivated and yields enhanced.

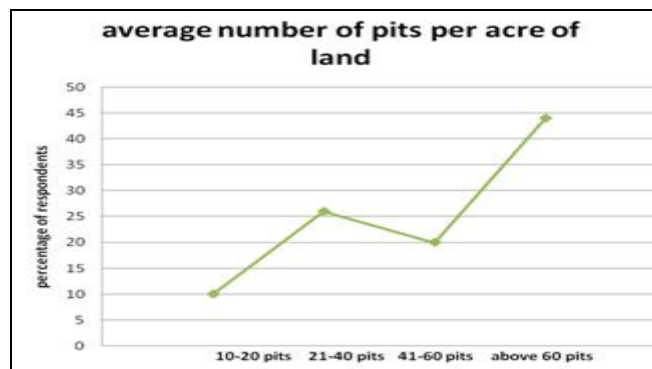


Figure 2

From figure 2, most of the respondent mentioned that an acre of land has dug pits between 40 and 60 and with the remaining between 10 and 40. Clay harvesting has a lot of impact on biodiversity, usually removal of vegetation. It can be deduced that if clay harvesting should continue in this manner in the coming decades, if not all, most of the vegetation on clayey soils would be destroyed, because all the vegetation is undergoing dramatic destruction in the quest of traditional occupation. Maeda *et al.* (1999) pointed out that both agricultural and grazing lands have been destroyed because of several pits being constructed on surface earth, whose effects are aforementioned by Davis, (1966); Freeze and Cherry, (1979) and Mason, (1997).

3.1. Depths of Mining Pits

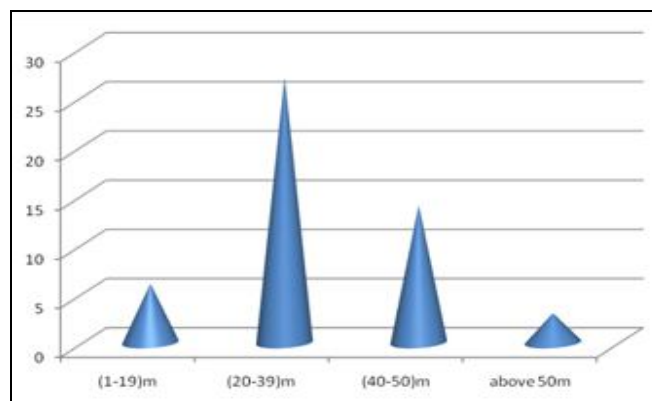


Figure 3

From figure 3, majority of the respondent harvested from pits with high depth. The effects of clay harvesting are not associated with humans alone but other farm animals and wildlife around the locality; therefore, there must be some form of training in order to curb some of the menaces during and after harvesting. This will serve as a panacea to most of the environmental chaos that occur at the harvesting communities. According to community members during community base response interview and survey, because these harvesting is done by open pit to appreciable high depth, there had been severally instances that animals when fall into such high depths are found dead and rotten polluting the air circulating the immediate environment. Water from the harvesting pits stagnate the area which serve as source of breeding sites for mosquitoes. According to Wayne, (2013) Permanent swamps are important source for mosquito. Closeness of clay harvesting pits to the residential areas has increased the breed of mosquitoes in the area resulting in an increase in the outbreak of malaria in the locality. No wonder malaria tops all the diseases reported in the municipal, according to the municipal health directorate, on the incidence of diseases in the district, as obtained from the District Health Management Team (DHMT), Malaria topped the list with 1,561 cases constituting 25.5% of all reported diseases. McMahon, (2001) reported that unprotected pits, for instance, during the rainy seasons, form breeding grounds for disease vectors such as mosquitoes and housefly which are the agents that spread malaria and water borne diseases.

4. Conclusion

Based on the analysis of the results from the research, the survey and the interview granted, it was realized that a greater number of the respondents engaged in clay harvesting as their livelihood. Seventy-five percent (75%) of the inhabitants harvest clay near residential areas and on farmlands which as a result made foodstuffs very expensive in the area. Because clay mining has actively been session in the area for more than thirty years and is not supervised by the Environmental Protection Agency (EPA) of the Kwahu West Municipality, most water bodies in the locality have been polluted as a result of clay harvesting. Vast agricultural farmlands have been destroyed and because there is no training and supervision of their work by the EPA there has been no land reclamation after clay harvesting. Majority of the respondents have little or no formal education and therefore have minimal knowledge about environmental

degradation. Clay harvesting has negatively affected the ecosystem of the area. In view of this, thematic educational programs should be organized for clay miners in the area by the government through the municipal assembly to educate them on the impacts of indiscriminate clay harvesting on the environment so that the clay miners become conscious of their activity to the environment. Workable and effectual Municipal Bye-Laws must be put in place to ensuring land acquisition for clay harvesting as well as reclaiming the used land after the harvesting activities. The EPA should intensify their supervisory role at the clay mining sites in these areas to curb the menace of disease outbreak in the area. Traditional rulers (chiefs) should ensure that clay harvesting in their communities should not be done close to drinking water source since such water bodies could easily be polluted. Government should financially assist research institutions and the universities to be able to find solutions to the problems associated with clay harvesting in the study area and other parts of the country where this activity goes on.

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