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RESEARCH ARTICLE

PERCEPTION OF BREWERY POLLUTION AMONG INHABITANTS OF KAASE IN KUMASI, GHANA

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ABSTRACT

Undoubtedly, brewery companies like many other commercial companies in Ghana contribute to the economic development of the nation. In fact, there is nothing new about companies being development agents. In this study, the perception of brewery's activities with respect to pollution among some inhabitants of Kaase Kumasi, Ghana was investigated. In the study, 80 randomly selected respondents from Kaase near the Guinness Brewery Limited were interviewed with the help of questionnaires. These were compared with their control counterpart ie 80 randomly selected respondents from high School Junction all in Kumasi, Ghana. Analysis of the results based on one's general knowledge of site of disposal of brewery waste showed that, knowledge of the dumping site was evenly distributed among both communities. Greater proportion of respondents around the upstream area of the Sissa stream in Kaase (27.5%) however, perceived odour emanated from the brewery affected their health compared to their upstream counterpart (13.75%). This was statistically significant ($p=0.0316$). The study also showed that, greater proportions of respondents from the Kaase area (Downstream of the Sissa stream) i.e., (97.5%) were of the view that malaria was a major concern affecting their family compared to respondents from High school junction (71.25%) ($p<0.0001$). Results from this study has shown that, inhabitants of Kaase living near Guinness Ghana Limited perceive the brewery could be polluting their environment with their production.

INTRODUCTION

Undoubtedly, brewery companies like many other commercial companies in Ghana contribute to the economic development of the nation. In fact, there is nothing new about companies being development agents (Blowfield, 2008). For instance, it is believed that the brewery industry with the intension of shifting from foreign raw materials to local resources use could be an incentive for the development of local supply chains. This has the potential to stimulate agricultural production in Africa (van Wijk and Kwakkenbos, 2011). Meanwhile, the fact that industries contribute to economic development of the nation alone does not necessarily mean there could be no negative socio-economic impacts from the companies' operations itself on quality of life of residents. It is argued that to save corporate image and financial performance, companies are to be socially responsible (Balabanis *et al.,* 1998). It is a well-known fact that, in the modern commercial era, companies and their managers are to a greater extent, obliged to integrate social and environmental concerns into their business operations. This they can do to interact with stakeholders in coping with well-publicized pressure from corporate social responsibility (CSR) (Boahen *et al.,* 2014). Thus, giving to charities, protecting the environment and helping solve social problems in their communities (Mohr *et al.,* 2001). These responsibilities and others that satisfy the ordinary people are expected of the breweries in Kumasi, the second largest city in Ghana.

Kumasi is part of the history of the brewery industry in Ghana. Kumasi has 2 brewery plants located at Kaasi and Ahensan as part of Guinness Ghana Breweries Limited (GGBL), a merger in 2004 between Heineken Ghana (Ghana Breweries Limited) and Guinness Ghana Limited (Britwum *et al.,* 2006, GGBL, 2011). The 2 breweries, hitherto, Ghana Breweries Limited (formerly ABC Brewery Limited) and Kumasi Brewery Limited had seen several transitions and transformations before the final merger (GBL, 1998). GGBL is listed on the Ghana Stock Exchange with a majority shareholder being the world's leading Total Beverage Alcoholic (TBA) business, followed by

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Heineken and Ghanaian institutions, investors and individuals (GGBL, 2011). Guinness Ghana Brewery Limited (GGBL) is the market leader in premium alcoholic and non-alcoholic drinks in Ghana with a market share of volume by 66% (beer) and 31% (soft) drinks, Britwum *et al.,* 2006). According to (GGBL, 2011), the brewery is committed to the following and others: responsible environmental citizen by investing in effluent treatment plants; and 3 key corporate social responsibilities related to supporting farmers through Sorghum project, providing safe drinking water through the Water for Life program since 2007 and the Alcohol in Society program designed to address misuse of alcohol in society through education and promotion (GGBL, 2011).

A study conducted by Nurick and Johnson, published in 1998 has shown that, when communities are given the opportunity to recount the impact of industries on quality of life, there could be a good list from health impact from pollution, environmental risk, safety etc. The Ghana Environmental Protection Agency (GEPA) has a programme for monitoring industrial companies' performance with respect to legal issues through environmental best practices to corporate social responsibility. From GEPA recent report (GEPA, 2014) most of the manufacturing companies in Kumasi, 9 out of 12 failed in the rating programme. The failure came largely from performance pertaining to legal requirements and community complaints management and relations. With the beverages companies in Kumasi, Coca Cola Bottling Company of Ghana scored good performance while Guinness Ghana Breweries Limited's performance was rated unsatisfactory (GEPA, 2014). Though the GEPA report indicates that these beverage companies have satisfactory corporate social responsibility, best environmental practices, and community complaints management and relations, it is however, not clear how the residents perceive the level of pollution of these companies of beverage companies and its health implications. It is only reported by (Britwum *et al.,* 2006) that communities are not happy with GGBL because of unmet needs, disrespect and poor relations. This paper therefore seeks to establish the perception of brewery's activities with respect to pollution among some inhabitants of Kaase Kumasi, Ghana was investigated.

MATERIALS AND METHODS

Study Area

The study was conducted in Kumasi within the vicinity of Guinness Brewery Limited as shown in Figure 1 below. The study population was limited to inhabitants of Kaase who resided within about 200 meter radius from the brewery. These respondents stayed at the downstream point of Sissa stream after effluents from the brewery has joined the Sissa stream. Their responses were compared with inhabitants residing around High School Junction, about 1000m away from the brewery which served as the control community. Theses respondents resided at the upstream point of the Sissa stream before effluents from the stream joins the stream.

The study site

Kumasi is a city in Ashanti Region, Ghana and is among the largest metropolitan areas of Ghana. Kumasi is located near Lake Bosomtwi, in a Rain Forest region, and is the commercial, industrial and cultural capital of Asanteman. Kumasi is approximately 300 miles (480 km) north of the Equator and 100 miles (160 km) north of the Gulf of Guinea.

The climate of the study area

Kumasi features a tropical wet and dry climate, with relatively constant temperatures throughout the course of the year. Kumasi averages around 1400 mm (55") of rain per year. The city almost features 2 different rainy seasons, a longer rainy season from March through July and a shorter rainy season from September to November.

The months of February through to November is one long wet season, with a relative lull in precipitation in August. Similar to the rest of West Africa, Kumasi experiences the harmattan during the "low sun" months. Lasting from December to February, the harmattan is the primary source of the city's dry season.

Research methods

The study used combinations of desk studies and in-depth interviews. These were augmented with questionnaire administration as well as field observations. Interviews and Focus Group Discussions (FGD) were organized with key informants whiles households were interviewed using the household survey questionnaires to augment the data collection. The use of multiple complementary methods made it possible to triangulate and eliminating bias that could occur if using only one method (Appiah-Effah *et al.,* 2014). Heads of households who had stayed within the community for more than 4 years and were willing to participate in the study were included in the study during the household survey. Households which fell outside the aforementioned criteria were however excluded from the study. Asante Twi, the main local language in the Ashanti region was used for the interviews. The study was conducted between February and July 2013.

Household survey

Questionnaires designed for households included both open-ended and closed questionnaires. According to previous studies, a sampling ratio of 5% of the total number of households offers a good representation of the population and to a tolerable level of accuracy (Appiah-Effah *et al.,* 2014). With this ratio, a total of 160 questionnaires were administered to households in both High School Junction (80 questionnaires) and Kaase (80 questionnaires). Households were selected at random and interviewed.

Data Analysis

The study was based on qualitative and quantitative methods of data analysis. Questionnaires were entered manually using Microsoft Excel 2007. Chi-square test was used to test for significance between categorical variables. Associations between dichotomous variables from respondents in Kaase area compared to those in the High School areas were also examined using Chi-square test (Gyasi *et al.,* 2011). Two-tailed tests were used with $p<0.05$ considered significant.

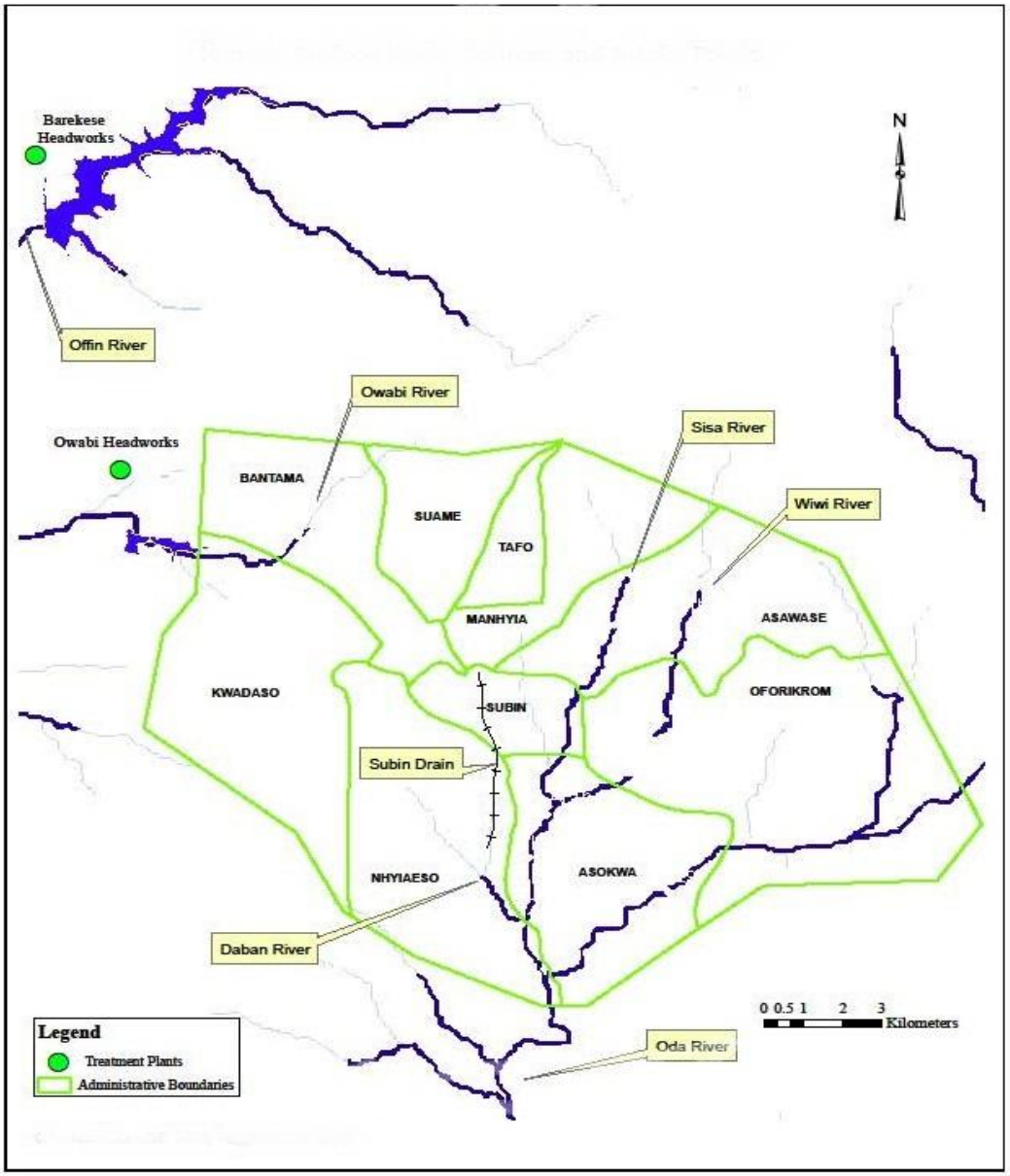

Figure 1. A map of Ghana (Left) with Kumasi and map of sections of Kumasi (Right) showing the Sissa stream (Blue lines)

RESULTS AND DISCUSSION

In this study, we sought to compare the perception of respondents who resided at either Kaase or High school Junction close to the Sissa stream where effluents from the brewery were discharged. Respondent who answered questionnaires from the Kaase area between the age group 20-39years were fewer (46.25%) compared to their control counterpart, High school junction (63.75%). This was statistically significant, p=0.0261 as shown in Table 1 below. Majority of these respondents who lived in the downstream of the brewery were males and were also the leaders of their household but have attained education at least up to senior secondary school level (Table 1).

Table 1. Demographic Data of Respondents from Upstream (High School junction) and Downstream (Kaase) in Kumasi, Ghana

Parameter	% Total (160)	% High School Junction (80)	% Kaase (80)	P-value
Age of Respondent				
Below 15	2(2.5)	0(0)	2(2.5)	0.1547
16-19	26(32.5)	9(11.25)	17(21.25)	0.0865
20-39	88(110)	51(63.75)	37(46.25)	0.0261
49-59	33(41.25)	14(17.5)	19(23.75)	0.3286
Above 59	11(13.75)	6(7.5)	5(6.25)	0.7547
Sex respondent				
Male	89(55.6)	41(51.2)	48(60)	0.2653
Female	71(88.75)	39(48.75)	32(40)	0.2653
Sex of Household head				
Male	106(132.5)	46(57.5)	60(75)	0.0192
Female	54(67.5)	34(42.5)	20(25)	0.0293
Educational Level of Respondent				
No formal education	25(31.25)	5(6.25)	20(25)	0.0011
Primary	30(37.5)	16(20)	14(17.5)	0.6854
JHS	57(71.25)	41(51.25)	16(20)	<0.0001
SHS	41(51.25)	15(18.75)	26(32.5)	0.0694
Tertiary	7(8.75)	3(3.75)	4(5)	0.6991
Marital status of Respondent				
Single	76(95)	38(47.5)	38(47.5)	0.0011
Living-in	8(10)	2(2.5)	6(7.5)	0.1468
Married	65(81.25)	37(46.25	28(35)	0.1474
Divorced	4(5)	1(1.25)	3(3.75)	0.3112
Separated	5(6.25)	2(2.5)	3(3.75)	0.6498
Widowed	2(2.5)	0(0)	2(2.5)	0.1547

Note: JHS means Junior High School, SHS means Senior High School

As part of the study, the sources of water for consumption and for domestic purposes were assessed based on the closeness of a respondent to the location of the brewery sight. Analysis of the results from the study showed that, majority of the respondents living at the Kaase of the brewery (47.5%) had household size that ranged between 4-6 compared to their control counterpart at High School Junction (23.75%) and this was statistically significant (p=0.0017) as shown in Table 2 below. The study also showed that, majority of respondents from the Kaase side of the brewery that is, 87.75% were also traders compared to those at the High school junction, that's is 53.45% (p=0008). This assessment did not come as a surprise because personal observation during visits to the study area showed that, most of the inhabitants living around Kaase near the brewery stayed in rented apartment close to the brewery and other industries like timber factories, livestock rearing etc. It is a well-known fact that beer is a millennium alcoholic beverage that allows consumers to taste different types and styles depending on how the production process was conducted. This have made the production process very attractive attracting many people not only with the desire to do business around its location but also have great interest to be employed by these beer production companies (Kanagachandran and Jayaratne, 2006). This assertion was consistent with this present study. The main sources of water usage for drinking and for other domestic purposes were assessed for respondents from this study and the result showed that, greater proportions of respondents from the kaase area of the brewery (85%) relied on water from Ghana Water Company Limited compared to respondents from High School junction (67.5%). The difference was statistically significant as shown in Table 2 below. Greater proportion of residence living around kaase near the brewery, relying on water for during from Ghana Water was anticipated. In depth interview during the study with some of the respondents living around Kaase close to the brewery showed that, the brewery depended on water from Ghana Water Limited for their major solvents demand. In this regard, efforts were made to ensure the brewery had adequate regular water supply for its daily operations both for production and cleaning of their vessels. By these processes, inhabitants close to the factory benefits from this constant flow much to the disadvantage of the upstream counterpart. This was consistent with a study conducted by Schuetze and Santiago-Fandiño published in 2013.

Within the Kaase area of the brewery, majority of the respondents who answered the administered questionnaires (96.25%) employed water mainly for drinking compared to their counterpart at the High school junction area (85.0%) as this was statistically significant (p=0.016) (Table 2). When questions regarding the perception of the quality of drinking water was posed, greater proportions of respondents in the High School Junction area, upstream of the Sissa stream (10%) responded their water were bad compared to their downstream counterpart, Kaase area (0%) as shown in Table 2 below (p=0.0037). Personal observation during visits to the study area showed that, most inhabitants at the High School Junction area of the Sissa stream either had hand dug wells in their homes or collected water from public stand pipes supplied by Ghana Water. Most of these inhabitants lacked pipe borne water in their homes as they refused to drink from the stream. It is an open secret that drinking water of doubtful quality could predispose one to a myriad of sanitation related ailment including Typhoid fever, cholera, dysentery etc. (Cock *et al.,* 2012).

We have reported earlier that the Sissa stream could be polluted by some industries discharging their untreated effluent directly into it (Gyasi *et al.,* 2014). This perception could have informed respondents that if the brewery was discharging its effluent directly into the Sissa stream, they could be at risk once people drank from this stream. This observation obviously did come as a surprise. This was consistent with this present study.

Study respondents were assessed on the perception of risk of poor sanitation exposure due to the brewery relation to one's location either upstream downstream side of the brewery.

Analysis of the results based on one's general knowledge of site of disposal of brewery waste showed that, knowledge of the dumping site was evenly distributed among both communities as shown in Table 3. Greater proportion of respondents around the upstream area of the Sissa stream in Kaase (27.5%) however, perceived odour emanated from the brewery affected their health compared to their upstream counterpart (13.75%).

Table 2. Respondents' Source of water for domestic purposes stratified based on closeness to brewery industry

Parameter	% Total (160)	% High School Junction (80)	% Kaase (80)	P-value
Household size of respondents				
1-3	94(117.5)	61(76.25)	33(41.25)	<0.0001
4-6	57(71.25)	19(23.75)	38(47.5)	0.0017
7-10	8(10)	0(0)	8(10)	0.0037
Above 10	1(1.25)	0(0)	1(1.25)	0.3158
Major Source of Livelihood				
Crop production	7(8.75)	3(3.75)	4(5)	0.6991
Trading	106(132.5)	43(53.75)	63(78.75)	0.0008
Livestock rearing	1(1.25)	0(0)	1(1.25)	0.3158
Charcoal burning	3(3.75)	0(0)	3(3.75)	0.0804
Pito brewing	0(0)	0(0)	0(0)	
Other	43(53.75)	34(42.5)	9(11.25)	<0.0001
Main water source				
GWCL	122(152.5)	54(67.5)	68(85)	0.0093
Mechanized water scheme	8(10)	1(1.25)	7(8.75)	0.0295
Borehole with hand-pump	11(13.75)	8(10)	3(3.75)	0.1182
Stream	0(0)	0(0)	0(0)	
Rainwater	0(0)	0(0)	0(0)	
Other (Specify)	19(23.75)	17(21.25)	2(2.5)	0.0002
Main water use				
Drinking	145(181.25)	68(85)	77(96.25)	0.0146
Cooking	6(7.5)	5(6.25)	1(1.25)	0.096
Bathing	1(1.25)	0(0)	1(1.25)	0.3158
Washing	1(1.25)	1(1.25)	0(0)	0.3158
Other uses	7(8.75)	6(7.5)	1(1.25)	0.0533
Perception of the quality MS				
Good	127(158.75)	53(66.25)	74(92.5)	<0.0001
Fair	25(31.25)	19(23.75)	6(7.5)	0.0046
Bad	8(10)	8(10)	0(0)	0.0037
Alternative water source				
GWCL	13(16.25)	11(13.75)	2(2.5)	0.0092
Mechanized water scheme	36(45)	1(1.25)	35(43.75)	<0.0001
Borehole with hand pump	48(60)	31(38.75)	17(21.25)	0.0157
Stream	7(8.75)	5(6.25)	2(2.5)	0.2462
Rainwater	47(58.75)	29(36.25)	18(22.5)	0.0562
Other (Specify)	10(12.5)	4(5)	6(7.5)	
Alternative water use				
Drinking	67(83.75)	54(67.5)	13(16.25)	0.3033
Cooking	19(23.75)	8(10)	11(13.75)	0.4635
Bathing	25(31.25)	9(11.25)	16(20)	0.1275
Washing	46(57.5)	6(7.5)	40(50)	<0.0001
Other uses	3(3.75)	3(3.75)	0(0)	0.0804
Perception of the quality alternate source				
Good	61(76.25)	25(31.25)	36(45)	0.0966
Fair	84(105)	45(56.25)	39(48.75)	0.3422
Bad	15(18.25)	10(12.5)	5(6.25)	0.1751

This was statistically significant (p=0.0316) as shown in Table 3. The brewery is one of the major alcoholic beverage in the Ashanti Region and in the nation as whole. Research has shown that, malt, which is one of the major product of the brewery is produced by roasting of malts and barleys in drums that has been custom designed at high temperatures to green malt which is a must for calameralization.

This process is characterized by a distinctive smell moving beyond the factory premises of most brew industries (Islam and Deegan, 2008). This was consistent with this present study

Greater proportions of respondents from the Kaase area (Downstream of the Sissa stream) i.e., (97.5%) were of the view that malaria was a major concern affecting their family compared to respondents from High school junction (71.25%) (Table 3)(p<0.0001). Majority of respondents from Kaase (75%) also believed activity of the brewery was polluting the Sissa stream compared to their counterpart community (High School Junction) (38.75%) and this was significant (<0.0001) as shown in Table 3 below. They were however unsure whether the brewery authorities were putting measures in place to curb the situation (Tabl3 3). Although the brewery currently could have doubtful quality, it could not possibly cause malaria. The only possible direct exposure could be direct inhalation of roasted malt emanating from the brewery premises and this could possibly not cause malaria (Mara et al., 2010). This assertion was inconsistent with this present study.

Table 3. Respondents perception of risk of sanitation based on closeness to brewery industry

Parameter	% Total (160)	% High School Junction (80)	% Kaase (80)	P-value
Awareness of GBL Place of discharge				
Yes	77(97.5)	44(55)	34(42.5)	0.1137
No	63(78.75)	28(35)	35(43.75)	0.2574
Don't Know	19(23.75)	8(10)	11(13.75)	Nil
Ways GBL activities affect Livelihood				
Health	85(106.25)	40(50)	45(56.25)	0.4283
Odour	33(41.25)	11(13.75)	22(27.5)	0.0316
Mosquito breeding	7(8.75)	3(3.75)	4(5)	0.6991
Flooding of stream	0(0)	0(0)	0(0)	Nil
Noise	2(2.5)	1(1.25)	1(1.25)	1
Traffic hazards /safety	9(11.25)	1(1.25)	8(10)	0.0163
Stream/stream pollution	0(0)	0(0)	0(0)	Nil
Groundwater pollution	0(0)	0(0)	0(0)	Nil
Other(Specify)	24(30)	24(30)	0(0)	<0.0001
Common disease affecting household				
Malaria	135(168.75)	57(71.25)	78(97.5)	<0.0001
Cholera	6(57.5)	4(5)	2(2.5)	0.4053
Diarrhea	4(5)	4(5)	0(0)	0.0428
Dysentery	1(1.25)	1(1.25)	0(0)	0.3158
Typhoid	1(1.25)	1(1.25)	0(0)	0.3158
Asthma	0(0)	0(0)	0(0)	Nil
Acute respiratory infection	0(0)	0(0)	0(0)	Nil
Other respiratory illnesses	1(1.25)	1(1.25)	0(0)	0.3158
Other (Specify)	12(15)	12(15)	0(0)	0.0003
Any idea how disease is caused				
Yes	83(128.5)	46(57.5)	37(46.25)	0.1544
No	59(73.75)	24(30)	35(43.75)	0.0715
Don't Know	18(22.5)	10(12.5)	8(10)	0.6168
Perceive GBL polluting stream around				
Yes	91(113.75)	31(38.75)	60(75)	<0.0001
No	42(52.5)	36(45)	6(7.5)	<0.0001
Don't Know	37(46.25)	23(28.75)	14(17.5)	0.0915
Any Mechanism by GBL to check Pollution				
Yes	18(22.5)	14(17.5)	4(5)	0.0048
No	58(72.5)	35(43.75)	23(28.75)	0.0077
Don't Know	84(105)	31(38.75)	53(66.25)	0.0005

Conclusion

It is well known fact that treatment of effluents before discharge into receiving waters may not be 100% fool proof. However, with about 80% treatment efficiency of most of these treatment plants, the chances of these effluent after discharge into streams could have little probability of causing some water washed and water based disease. This may come as a great relieve to inhabitants resorting to the stream as a source of drinking water downstream. Results from this study has shown that, inhabitants of Kaase living near Guinness Ghana Limited perceive the activity of the brewery could be polluting their environment with their production. It is therefore recommend that management of the brewery ought to undergo massive orientation to alter the current state of perception of these inhabitants

Conflict of Interest

The authors declare that they have no competing interests.

Authors Contribution

SFG: Contributed in study design of this work, collected data from the field, carried out Data entry, assisted in data analysis and interpretation of analysed data, assisted in writing of this manuscript.

EA: Made substantial contributions to conception and design of the study, involved in drafting the manuscript and revising the manuscript critically for intellectual content approval prior to submission, gave the final approval for the publication of this manuscript.

DB: Made substantial contributions to conception and design of the study, assisted in statistical analysis and interpretation of analysed data, editing of the manuscript. He also agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy of this work.

All 3 authors read and gave final approval for submission of this manuscripts.

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REFERENCES

Accra, Ghana: Epa Ghana. Available: Http://Www.Epaghanaa koben.Org/Rating/Listmanufacturers2(Accessed5/15/2014

Appiah-Effah, E., Nyarko, K. B., Gyasi, S. F., and E. Awuah 2014. Faecal sludge management in low income areas: a case study of three districts in the Ashanti region of Ghana, IWA Publishing 2014 *Journal of Water*, Sanitation and Hygiene for Development | 04.2 | 2014, Doi: 10.2166/washdev.2014.126

Balabanis, G., Phillips, H. C. and Lyall, J. 1998. Corporate Social Responsibility And Economic Performance In The Top British Companies: Are They Linked? *European Business Review,* 98, 25-44.

Blowfield, M. 2008. Business, Corporate Responsibility, And Poverty: Background Paper Unrisd Flagship Report On Poverty (Online), Draft. Available: Http://Www.Unrisd. Org/80256b3c005bccf9/(Httpauxpages)/2e9f30f0cb36323 bc12575e000295b2f/$File/Webblowfieldii.Pdf (Accessed 19/05/2014).

Boahen, K. A., Barima, A. K., Nana, I. J., Emmanuel, M. A., Kwaku, K.K. and Ceasar, J. A. 2014. Assessment Of Management Attitudes On Corporate Social Responsibility In Ghana: A Case Of Some Selected Companies In The Tema Metropolis. Url: Http://Www.Ejbss.Com/Recent. Aspx, Issn: 2235 -767x *European Journal Of Business And Social Sciences,* 2, 102-13.

Britwum, A., Enu-Kwesi, F. and Akorsu, A. 2006. Fnv Company Monitor: Research Report 2006. Fnv Company Monitor Research Report. Available: Http://Somo.Nl/ Publications-En/Publication_2640/At_Download/Fullfile (Accessed 15/05/2014).

Brown Joe and S. Clasen Thoma, 2012. High Adherence Is Necessary To Realize Health Gains From Water Quality Interventions, Published: May 07, 2012, Doi:10.1371/ *Journal,* Pone.0036735

Cock Kevin, M., De, Aasen Bernt and Andrus K. Jon, 2012. Elimination of Cholera Transmission In Haiti and the Dominican Republic, Vol 379 January 21, 2012, Doi:10.1016/S0140-6736(12)60031-www.Thelancet.Com

Gbl, Ghana Breweries Limited. 1998. Prospectus: Ghana Breweries Limited. Listing By Means Of An Introduction, Http://Www.Annualreportsghana.Com/Home/Documents/ Circulars/Companies/Ghana-Breweries-(Prospectus,- Listing-By-Introducti.Aspx (Accessed 16/05/2014).

Gepa, Ghana Environmental Protection Agency. 2014. List Manufacturers: Akoben 2012 (Online).

GEPA, Ghana Environmental Protection Agency. 2014. List Manufacturers: AKOBEN 2012 [Online]. Accra, Ghana: EPA Ghana. Available: http://www.epaghanaakoben.org/ rating/listmanufacturers2 [Accessed 5/15/2014.

Ggbl, Guiness Ghana Breweries Limited. 2011. Notice Of Extraordinary General Share Holders Meeting. Notice Http://Www.Annualreportsghana.Com/Home/Documents/ Circulars/Companies/Guinness-Ghana-Breweries- (Circular-For-Extraordina.Aspx (Accessed 15/05/2014).

Gyasi Samuel Fosu, Esi Awuah John Asiedu Larbi, 2011. Assocaition of Perception Of Risk Factors For The Development of Buruli Ulcer, *Asian Journal Of Biological Science*, 4:483-497, Doi: 10.3923/Ajbs.2011.483.497

Gyasi, S. F., Appiah-Effah, E. and A. Nkansah 2014. Microbial Impacts of Brewery Effluent Discharge On Sissa River: A Case Study of Kaase In Kumasi Ghana. *Research Journal of Microbiology,* Doi: 10.2923/Jm.2014.

Islam, M. A. and Deegan, C. 2008. Motivations For An Organisation Within A Developing Country To Report Social Responsibility Information: Evidence From Bangladesh. *Accounting, Auditing and Accountability Journal,* 21, 850-874. Http://Researchbank.Rmit.Edu.Au/ Eserv/Rmit:6705/Islam.Pdf

Kanagachandran K. and Jayaratne, R. 2006. Utilization Potential Of Brewery Waste Water Sludge As An Organic Fertilizer, *Journal of the institute of Brewing*, Vol. 112, No. 2, 2006publication No. G-2006-0619-434 © 2006 The Institute of Brewing and Distilling, Http://Onlinelibrary.

Wiley.Com/Doi/10.1002/J.2050-0416.2006.Tb00236.X/ Pdf

Mara, D., Lane, J., Scott, B. and Trouba, D. 2010. Sanitation And Health. Plos Med 7(11): E1000363. Doi:10.1371/ *Journal,* Pmed.1000363

Mohr, L. A., Webb, D. J. and Harris, K. E. 2001. Do Consumers Expect Companies To Be Socially Responsible? The Impact of Corporate Social Responsibility on Buying Behaviour. *The Journal of Consumer Affairs*, 35, 45-72, Isbn: 978-0-415-71676-5

Nurick, R. and Johnson, V. 1998. Towards Community Based Indicators For Monitoring Quality of Life and The Impact of Industry In South Durban. *Environment and Urbanization*, 10, 233-250. Http://Eau.Sagepub.Com/ Content/11/2/247.Full.Pdf

Schuetze Thorsten and Santiago-Fandiño Vicente, 2013. Quantitative Assessment Of Water Use Efficiency In Urban And Domestic Buildings, Water 2013, 5, 1172-1193; Doi:10.3390/W5031172, ISSN 2073-4441, Www.Mdpi.Com/Journal/Water

Van Wijk, J. and Kwakkenbos, H. 2011. Beer Multinationals Supporting Africa's Development? How Partnerships Include Smallholders Into Sorghum-Beer Supply Chains. In: Van Dijk, M.P. and Trienekens, J. Promoting Sustainable Global Value Chains: The Role of Governance (Online), Forthcoming. Available: Http://Partnershipsresourcecentre.Org/Website/Var/Assets/Public/Publicaties/Papers/Papers-2010/Vanwijk-Kwakkenbos_Beer_Multinationals_Chapter_Finalfin.Pdf (Accessed19/05/2014)

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