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# Boreholes Provision, Health, and Personal Hygiene Issues Relating To Poverty Reduction in The Atebubu And Afram Plains Districts of Ghana

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**Abstract**

Prior to boreholes being provided in the study area (the Atebubu and Afram Plains Districts), the major cause of poverty was identified as the lack of potable water. Poor health was common due to recurring infestation with water borne/related diseases contracted from patronage of surface water sources. These diseases, especially guinea worm, physically incapacitated both adults and children. Thus, ill-health and time poverty due to long hours spent searching for water combined to deny adults of basic substantive freedoms and compromised their ability to engage in productive livelihoods activities to earn income to facilitate their emergence from poverty. Also, the tedium of searching for water in the physical environment affected the physical health and cognitive capacity of children resulting in very poor learning experiences at school. The sample size for the study was 1,200 household respondents from eighty communities provided with boreholes selected by simple random sampling technique. Six hundred household respondents from 34 Control communities (without boreholes) were also selected by simple random sampling. Quantitative and qualitative research instruments were employed in primary data collection in both Districts. Findings from the study showed 96.9% of respondents indicated complete eradication of guinea worm from their communities resulting in freedom from the incapacitating disease; 87.4% indicated improved health. Also, 87.9% of respondents indicated boreholes facilitated improved personal hygiene. Boreholes provision helping to improve infant and child health was indicated by 89.0% of respondents. Counterfactual evidence from the Control communities showed 71.1% of respondents indicated very poor hygiene practices prevalent.
**Key words:** Boreholes; Health; Personal hygiene; Waterborne/related diseases; Opportunistic and Occupational poverty.

## 1. Introduction

It has been noted that the deficiency or lack of potable water is a vital, ruthless agent of infant and child mortalities but providing boreholes is among one of the best strategies for eradicating the menace. Many people ingest water of poor quality, not because they are unaware of the dangers associated but just because they have no choice. Lacking potable water, by implication compromises the quality of life of women and young children in rural communities. They have to trek long distances and long hours to locate surface water sources to get water for their households. The burden of carrying water over such long distances have severe health implications in the short and long run (La Frenierre, 2009; Blackden and Wodon, 2006; UNDP, 2006).

In addition, the effective participation of children in school is also compromised as there is much absenteeism by children from school. Even when they attend school their attention deficits are very high and they are unable to focus to understand what they are taught (Mertaugh, et al, 2009; Abadzi, 2007). As a result they most often fail their basic school examinations and are unable to progress to the higher levels of education. They fall right back into the poverty trap their parents are living in with not much hope of new aspirations of their own but to join the masses labeled as "peasant farmers". Due to the acquisition of little knowledge at school, these quasi-illiterate children enter the labor force but are unable to make any difference but rather perpetuate the cycle of poverty. Conversely, many studies reveal that good education in childhood, especially for females, becomes an eventual liberator from the scourge of diarrhea and other water borne and water related diseases (Pruss-Ustun, et al, 2008; Bartram, 2008; World Bank, 2006).

Not having access to potable water constitutes a critical form of deprivation that threatens life, causes untimely deaths, seriously undermines the potential and full utilization of human capabilities, destroys opportunity and also undermines human dignity. The daily availability of potable water however serves as a powerful preventive means for communities to reduce water-borne and water-related diseases. Prevalent diseases in rural communities such as diarrhoea, guinea worm, schistosomiasis, malaria, trachoma and other water borne and water-related diseases that often incapacitates and blights human potentials can be totally eradicated with just a little commitment and the political will by Governments and donor partners who can invest consistently in the provision of potable water to rural communities, backed by local capacity building to ensure sustainability (UNDP, 2006; Sachs, 2005; Nussbaum, 2005).

Thus, potable water infrastructure provision in rural communities is quintessential for sustaining the health, maintaining the dignity of all people and progressively moving them out of poverty. Studies have proven

the importance of potable water in being able to save the lives of millions of children, foster educational achievements, and release people from diseases that entrench them in chronic poverty (Prahalad, 2010; World Bank, 2010; UNDP, 2006).

## 2. Problem Statement

Poverty is often the outcome of a combination of multiple factors made up of environmental, social, economic, and political processes which interact and most often reinforce each other in ways that compounds the poverty experience of poor people (World Bank, 2001). To help people emerge from such deprivation calls for development interventions which lies within the human development framework to help them regain and enlarge their substantive freedoms for capacity acquisition, widen their choices, and enhance their capabilities. These results from the interventions further lead to extensively increasing opportunities denied under poverty, substantially bridging the opportunities inequality gap and the issue of place-of-birth disadvantage (World Bank, 2006).

This people's-centered approach fosters progressive reduction in poverty, ending the powerlessness experience, and breaking the vulnerability syndrome within the chronic poverty situation people find themselves. The ultimate product is the transformative change experience which manifests as improvement in quality of lives, gradual but progressive emergence from poverty, human rights enhancement, and the ending of personal and household insecurity (UNDP, 1990; 1997).

The importance of good health to poor people cannot be overemphasized because physical health is vital for all types of livelihoods, especially, agriculture, on which many poor people in rural communities so much depend. Therefore the prospect of illness is a major source of worry, which is costly in terms of being incapacitated, lost time and earnings, and the ultimate concomitant effects of poverty. The incidence of waterborne diseases such as guinea worm infection, diarrhoea, acute stomach ailments, schistosomiasis, and trachoma were common prior to the provision of boreholes, and these were problematic issues to the inhabitants of both the Atebubu and Afram Plains Districts (World Vision Ghana, 2003).

Water-related illness creates a devastating and lasting drain on household resources which culminates in both opportunistic and occupational poverty. In the Atebubu and the Afram Plains Districts of Ghana guinea worm incapacitation did not allow for wealth creation and assets acquisition for well-being. Poverty was pervasive and households lived under acute conditions of illness and deprivations. Conditions of this nature denotes poverty with basic characteristics such as acute economic deprivation or the persistent lack of cash, insecurity of future, adoption of survival and coping mechanisms and strategies, fear of the future, lack of hope, despair, apathy, vulnerabilities to illnesses, and social disorder. Unsafe water and poor hygiene practices were the leading causes of avoidable death and disease, especially among children and these had serious economic and social consequences manifesting in extreme forms of opportunistic and occupational poverty. Not having potable water and a healthy environment to live in were major global issues prevalent in the study area (Atebubu and the Afram Plains Districts) which called for interventions (World Vision Ghana, 2007a; 2007b).

This study attempts to describe how the provision of boreholes, as a developmental intervention, has generated positive outcomes in relation to the well being of the inhabitants of the study area. Household health, and personal hygiene practices outcomes are examined to understand how boreholes provision have caused social and economic transformations leading to improved health and improved personal hygiene practices and progressive reduction in poverty.

The Atebubu and Afram Plains Districts (the study area) are located in the Brong Ahafo and Eastern Regions of Ghana respectively. Though both districts have very fertile lands supportive of agrarian livelihoods their levels of poverty was very high (Ghana Statistical Service, 2000). Prior to the drilling of boreholes both districts also lacked basic socio-economic infrastructure such as boreholes, health posts, schools and market centers. In terms of commonality of adverse geography, these districts were the most guinea worm endemic in the country as at 1990 (Ghana Health Service, 2007). Their geographical location is primarily rural and the two districts share almost the same climatic types and same geological formations (Government of Ghana, 2007). However, in terms of geographical space and locations, the two districts are almost 312 kilometres apart.

## 3. Methodology

For this study the population of interest was drawn from areas where World Vision drilled 363 boreholes in 249 communities in the Atebubu and Afram Plains Districts from 1990 to 2003 (World Vision Ghana, 2003). The sampling frame was thus based on the database of boreholes drilled. The probability sampling technique was employed to obtain the sample needed for the study. This technique allowed for each individual unit in the population universe to have a chance or probability of being included in the sample. Specifically, the probability technique - Simple Random Sample (SRS), was used to select the samples (communities and respondents) for this study (Guiseppe, 2006; Kreuger & Neuman, 2006).

Thirty-two per cent of communities with boreholes (Program communities) were sampled. This gave a

total of eighty (80) communities with boreholes (Atebubu - 41; Afram Plains - 39). Thirty-four (34) communities in the same geographical area without boreholes were also sampled as Control communities (Atebubu – 20; Afram Plains – 14). Large communities with populations over 5,000 were not included in the sampling frame so as to minimize biases. Fifteen respondents were selected from each program community to arrive at a households respondents sample size of 1,200. Six hundred (600) respondents were also sampled by the simple random technique from the 34 Control communities.

Primary data were collected from communities sampled using an integrated approach of quantitative and qualitative data collection methods. The data collected from the Control communities located in the study area served as the counterfactual evidence for effective impact analyses. Information were also gathered on the situation before and after boreholes were provided in terms of the sources of water, the availability and access to potable water, health and personal hygiene status, and the capacity for engaging in livelihoods occupations.

The quantitative data were analyzed through the use of SPSS computer-based analysis applications to generate the results. Content analysis methods were employed to analyze the qualitative information gathered. The unit of analysis was 'households'. Non-parametric data analysis methods, especially descriptive statistics were employed to analyze the data collected.

### 3.1 Theoretical /Conceptual framework

As depicted in Figure 1, access to potable water sources has been created as a result of providing boreholes in rural communities. Consistent patronage of the boreholes leads to the eradication of waterborne/related illnesses such as guinea worm, trachoma, diarrhea, acute stomach pains, and skin diseases such as yaws and scabies. Subsequently, improved physical health emerges and utilized in occupational livelihoods engagements to earn income and create wealth. Time gains from accessing potable water from nearby boreholes are also invested in high income earning occupational livelihoods activities. Wealth creation involves incomes savings accruing from all occupational livelihoods initiatives.

Time gains from improved health of adults also manifest in increased productivity, improved economic capacity leading to wealth creation, and the ability to provide basic domestic household needs. There is also the emergence of improved quality of life and the attendant visible demonstration effects in assets acquisition and sustained economic capacity, improved quality of life, and progressive reduction in poverty. These benefits derived from the availability of boreholes in rural communities serve as major drivers for continual patronage and encourages people to bear the responsibility of borehole repair and maintenance to ensure continual potable water availability in households (Fisher, 2011; Fosenka, 2008).

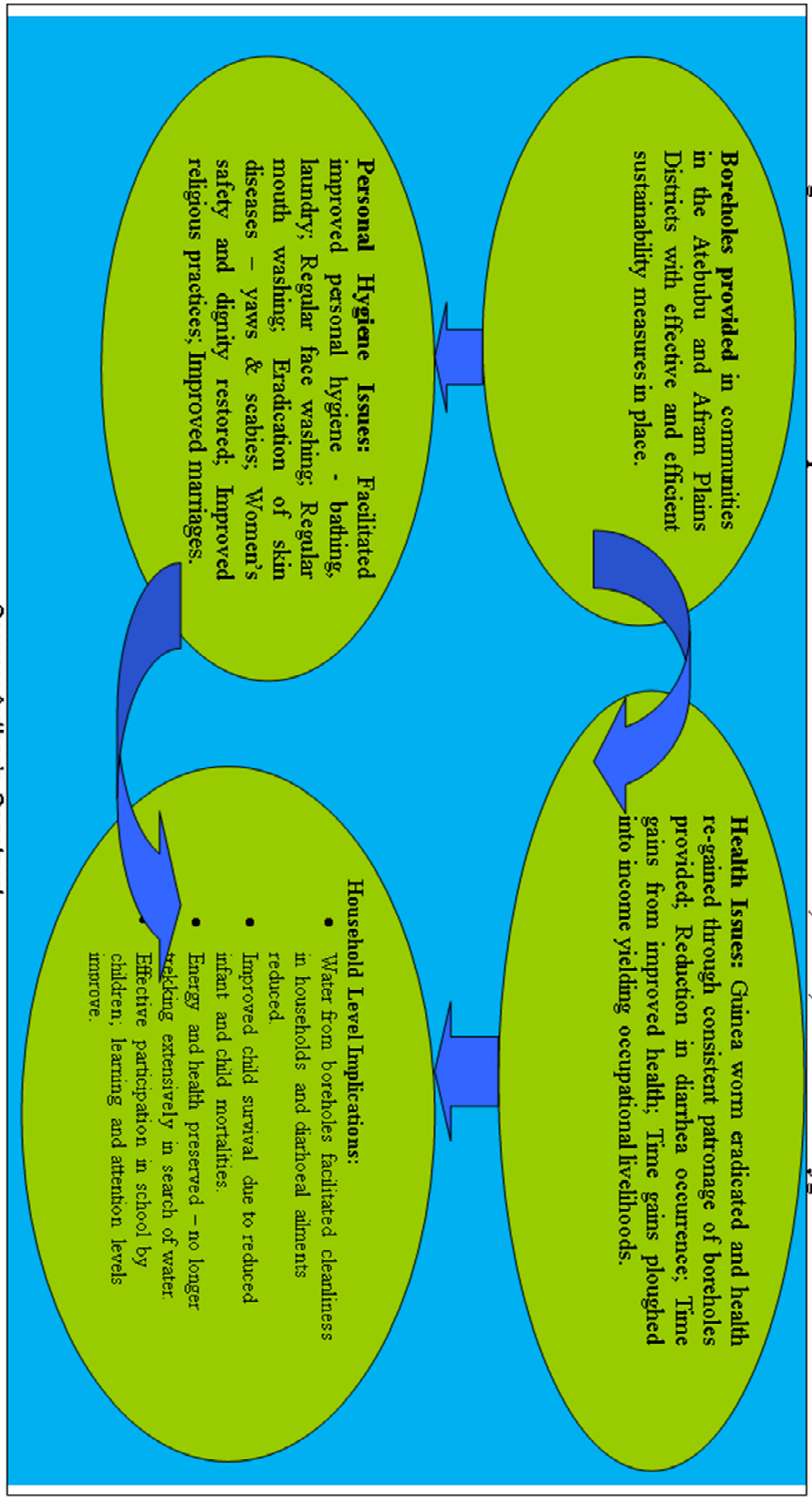



**Figure 1: Theoretical/Conceptual Framework - Boreholes Provision, Health, And Personal Hygiene Issues**

**Source: Author's Construct**

It also further indicates that effective and efficient sustainability measures have been put in place for continual assurance of potable water availability, time and human energy savings and the elimination of environmental risks to human safety and health.

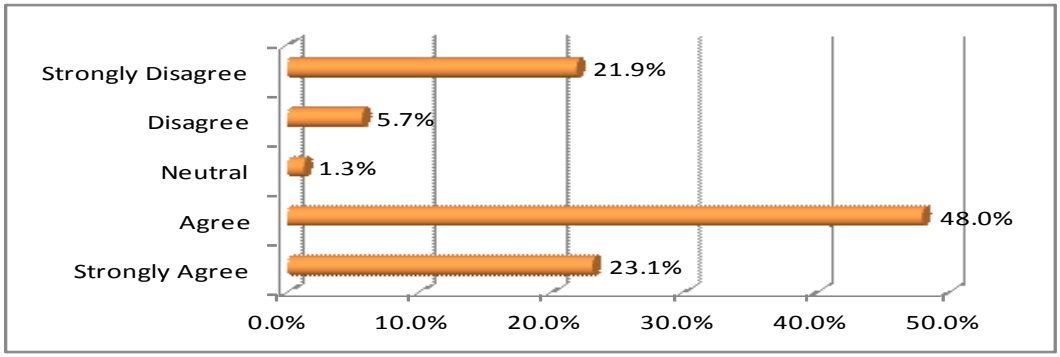
Increased access to boreholes produces multiple and incremental beneficial impact on health (Pruss-Ustun, et, al, 2008), and in this study, health benefits emerging from the framework include: safe, clean drinking (potable) water now available, and victims of water deprivation now revert to normal healthy drinking culture; guinea worm disease eradicated and health re-gained through consistent patronage of boreholes; substantive freedoms regained; reduction in diarrhea; reduction in infant and child morbidity and mortality. Potable water availability facilitates working at occupations to earn livelihoods; effective participation in school by children; effective participation in labor force and job market; skills acquisition and capabilities improvements; building of social cohesion; and physical community growth.

In relation to personal hygiene issues, boreholes facilitated improved personal hygiene practices such as regular face washing; regular mouth washing; regular bathing; regular laundry; improved marriages; improved religious worship; and created great conveniences and human dignity. In households water from boreholes facilitates cleanliness, women's safety and human dignity is restored and assured. The improvement in human well being enables people to offer their best to national development as they work and add to the national gross domestic product. It also gives people equal opportunities to attain their life's aspirations. Conversely, a sick population constitutes a burden on national development.

## 4. Results

Results from the study indicate that through the impact of boreholes provided water-borne parasitic diseases have almost become an issue of no public health significance in the Atebubu and Afram Plains Districts. This achievement has brought immense social and economic benefits to the beneficiaries and directly contributed to reduction in poverty. Results from this study indicate that 94.4% of survey respondents indicated very poor personal hygiene in their households prior to boreholes being provided. They indicated bathing was very irregular and skin diseases were prevalent. As many as 90.8% of respondents indicated poor health prior to the provision of boreholes. In Control communities, 71.1% of respondents (Strongly Agree 23.1%, Agree 48.0%) indicated very poor hygiene issues as existent in their households as at the time of the survey, as shown in Figure 2.

**Figure 2: Very poor personal hygiene prevalent in households in Control communities**

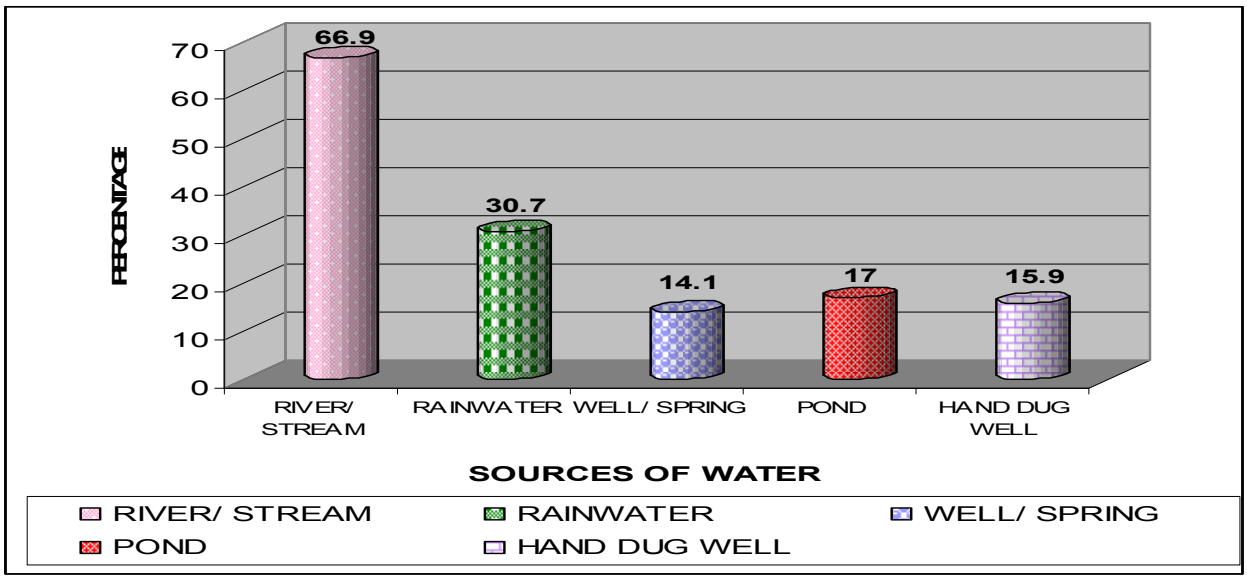



**Source: Fieldwork, 2006**

As to the sources of water before boreholes were provided in the Atebubu and Afram Plains districts, 66.9% of population surveyed indicated they patronized rivers and streams during the rainy season as depicted on Figure 3. In addition, 30.7% also used to depend on rain water. Comparatively, 79.9% of respondents from households in the Control communities indicated they patronize rivers and streams. This indicates the very high risk Control communities are continually exposed to and in contracting water-borne and water-related diseases that often incapacitates them for several months and keep them in cyclical opportunistic poverty.

**Figure 3: Sources of water before boreholes were provided in communities**



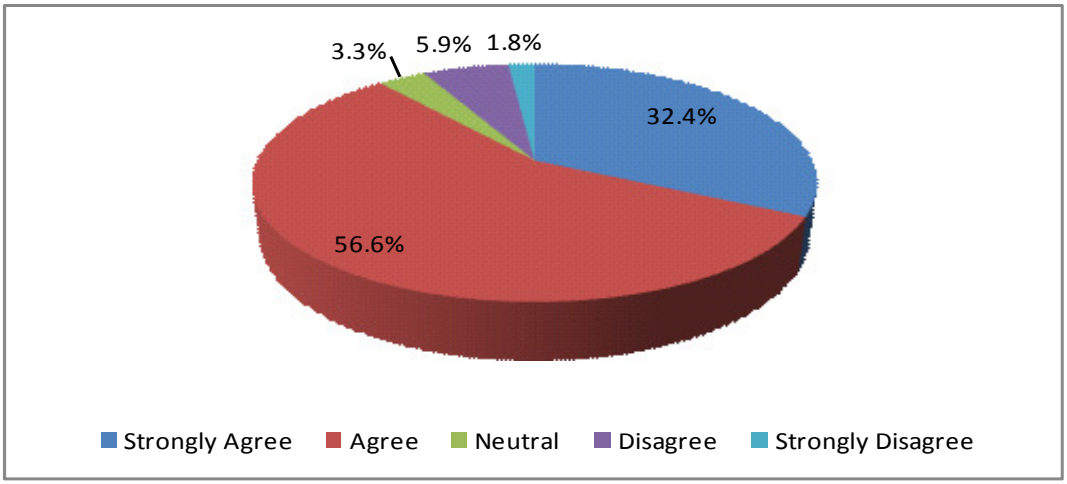

**Source: Fieldwork, 2006**

Continual potable water availability is therefore of extreme importance in rural communities as indicated by 92.2% of In-depth-Interview respondents in Program communities who indicated they no more worry as to where to go for water due to the availability of boreholes in and around their communities.

Almost ninety-six per cent (96.1%) of respondents from households in Program communities indicated that they now have access to more than 20 litres of potable water daily for each person to meet their needs. This represents a major break from the past when prior to boreholes provision they had to walk for several hours daily searching for water as indicated by 94.8% of respondents. Potable water availability from boreholes in households facilitated improvement in physical health as indicated by 96.6% of respondents. It also promoted personal hygiene practices and the health regained has been channeled into gainful economic activities for income generation to reduce poverty in households.

Prior to boreholes being provided the occurrence of infant and child morbidity and mortality in households was very high as affirmed by 82.2% of respondents. However, Figure 4 shows an improved situation after boreholes were provided as indicated by 89.0% of respondents (32.4% Strongly Agree, while 56.6% Agree) from Program communities. This shows the vast improvement in the health of infants and children in the Atebubu and Afram Plains Districts. This also has implied consequences of saving time and financial resources to reduce poverty. Time spent by women to seek medical care for their children are now channeled into occupational livelihood activities to increase output and earn more income.

**Figure 4: Boreholes provision helping to improve infants and child health in households**



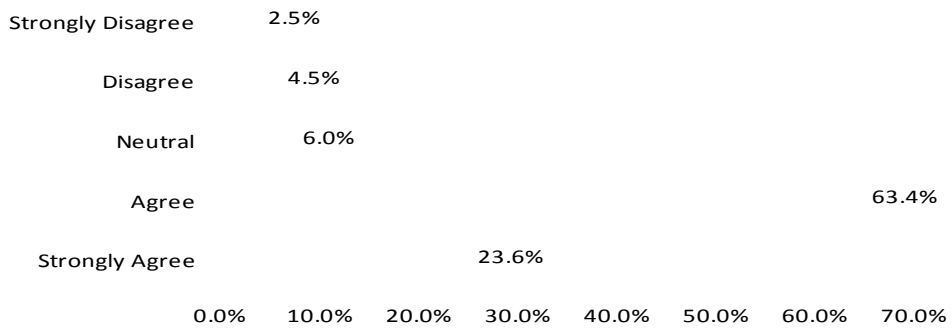

**Source: Fieldwork, 2006**

Again, funds formerly used to cater for children's ill health are now saved and used to improve the quality of life in households or invested in income earning activities. The sum of these efforts fosters improved quality of life and simultaneously supports gradual reduction in poverty in households. However in Control communities 36.7%

of respondents indicated the presence of infant and child mortality in their households.

As depicted in Figure 5, 87.0% of respondents (23.6% - Strongly Agree, and 63.4% - Agree) indicated that there was poor health, and people were unable to access good healthcare before the provision of boreholes in their communities. In contrast, as shown in Table 1, 87.4% of the respondents (34.3% Strongly Agree, while 53.1% Agree) indicated that provision of boreholes has contributed to improved health in their households. This has important implications for improved ability gained and time gains to engage in livelihood occupations to earn income to reduce poverty.

**Figure 5: Presence of poor health and inability to access good healthcare before the provision of boreholes in communities**




**Source: Fieldwork, 2006**

**Table 1: Provision of boreholes assisting to improve health in households**

| Response | Frequency | Percentage (%) |
|---|---|---|
| Strongly Agree | 412 | 34.3 |
| Agree | 637 | 53.1 |
| Neutral | 45 | 3.8 |
| Disagree | 71 | 5.9 |
| Strongly Disagree | 35 | 2.9 |
| Total | 1200 | 100.0 |

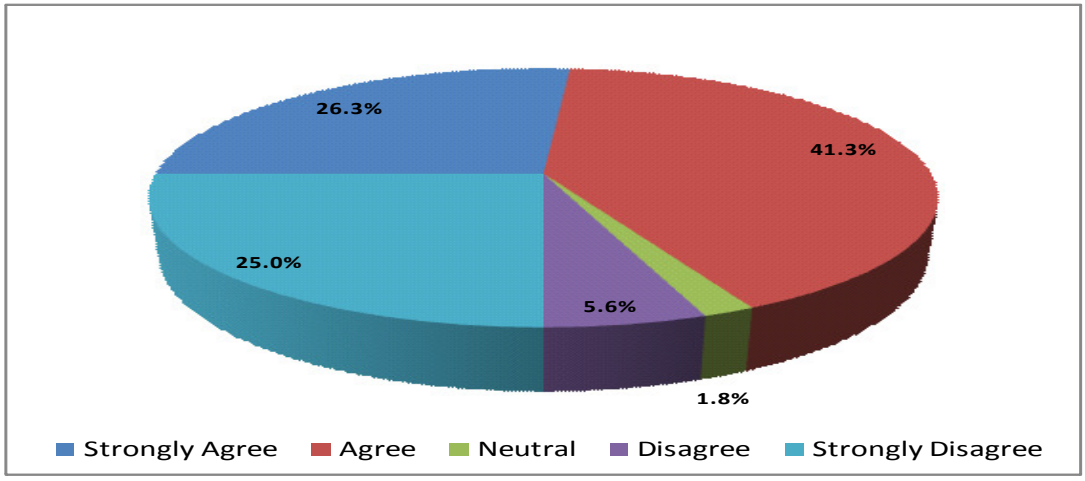
**Source: Fieldwork, 2006**

Figure 6 shows 67.6% of respondents (26.3% Strongly Agree, while 41.3% Agree) indicating that before the provision of boreholes there was total incapacitation of members of their households as a result of guinea worm infection. This incapacitation lasted for about eight months and during such times people were unable to work at their occupations (especially farming) to earn income. This condition entrenched them in continual poverty.

In the Atebubu and the Afram Plains, guinea worm infestation incapacitated whole communities due to the lack of potable water. This disempowered people and caused poverty which was cyclical and pervasive in households. The lack of economic well being led to low incomes, low purchasing power, low capacity in terms of existing assets to withstand vulnerabilities and therefore people were vulnerable to calamities, which further lead to exposure to extreme forms of poverty.

**Figure 6: Guinea worm incapacitation**

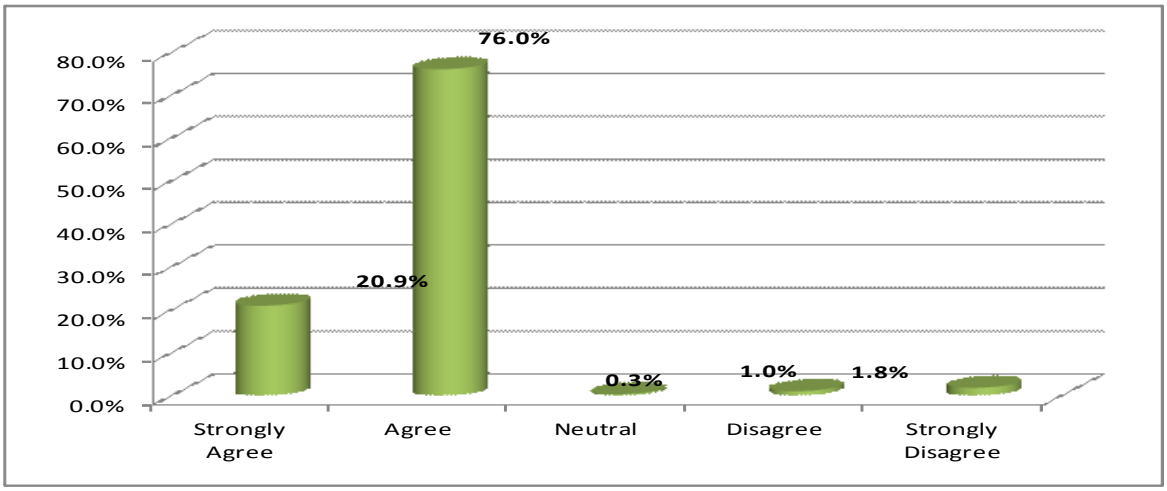



**Source: Fieldwork, 2006**

Also, guinea worm incapacitation did not allow for wealth creation and assets acquisition for well-being. Opportunistic and occupational poverty were pervasive and households lived under acute conditions of illness and deprivations. However, the boreholes provision program has completely changed this hopeless scenario to one of hope and freedoms to fully utilize one's time and capabilities to achieve life aspirations.

As depicted in Figure 7, 96.9% of respondents (20.9% Strongly Agree, while 76.0% Agree) indicated the non-existence of guinea worm in their community as at the time the survey was carried out. This again is a major indicator and proof of the effectiveness of the provision of boreholes in eradicating guinea worm and enabling people in communities regain their health.

**Figure 7: Guinea worm eradicated from community**



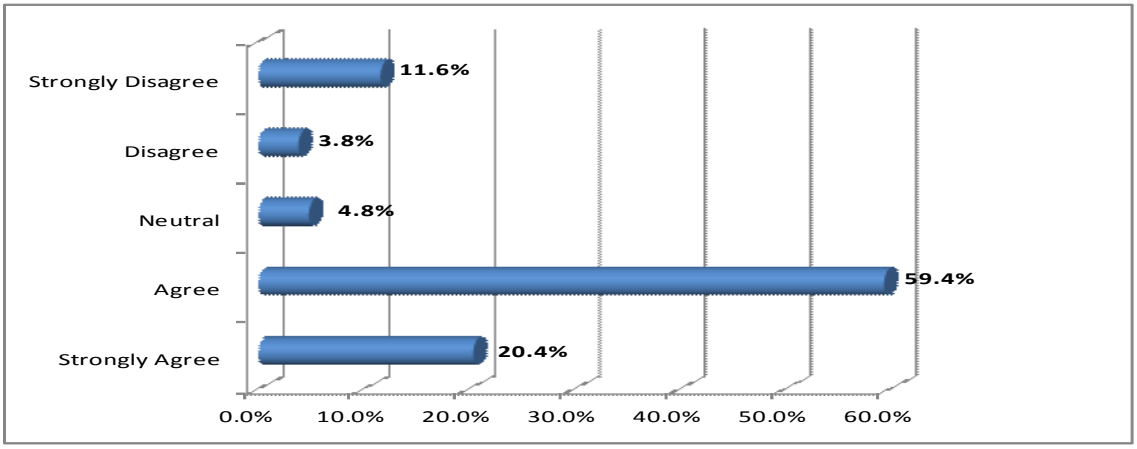

**Source: Fieldwork, 2006**

They also regained their social and economic freedoms and are able to work and engage in occupations to earn income to reduce the poverty in their households. In contrast, 47.2% of respondents in Control communities indicated guinea worm presence in their communities as at the time the survey was conducted.

As shown in Figure 8, 79.8% of respondents (20.4% Strongly Agree, while 59.4% Agree) indicated borehole provision contributing to eradication of guinea worm from their households.

**Figure 8: Boreholes provision contributing to guinea worm eradication from households**

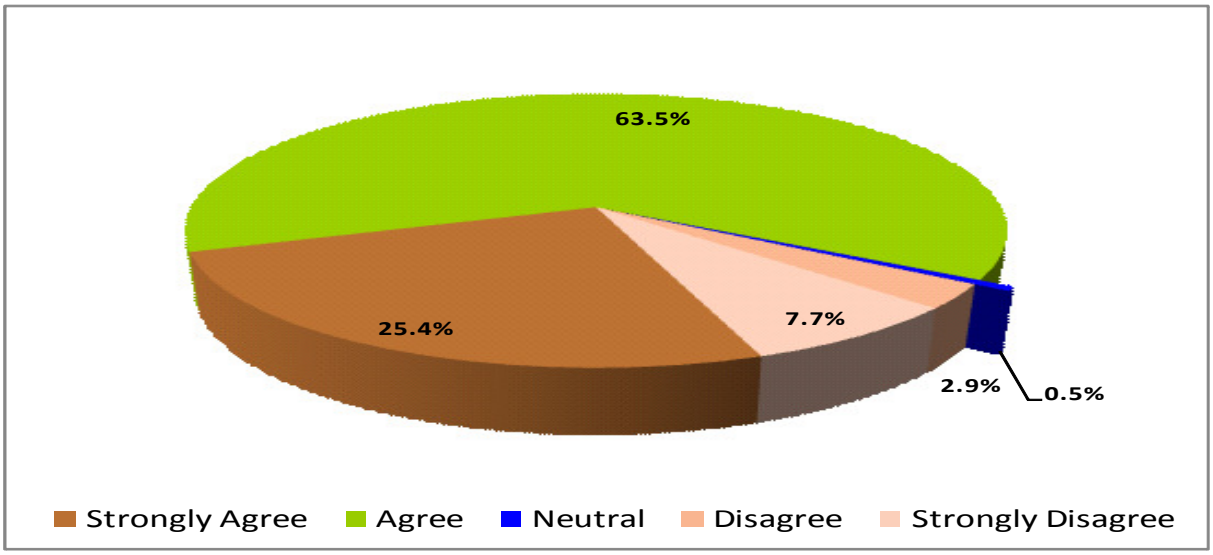



**Source: Fieldwork, 2006**

This again is also a major indicator and proof of the effectiveness of the provision of boreholes to eradicate guinea worm completely and enable communities regain their social and economic freedoms and be able to actively engage in livelihood occupations to earn income, create wealth, and invest in the lives of their children's education. These lead directly and indirectly to improvement in the quality of life and eventual poverty reduction.

Figure 9 shows 88.9% of respondents (25.4% Strongly Agreed, while 63.5% Agree) indicated that poor personal hygiene was common prior to the provision of boreholes in Program communities. This contributed much to the ill-health of many rural inhabitants and their inability to work to earn much income to break from poverty. In contrast, Table 2 depicts 87.9% of survey respondents (27.3% Strongly Agree and 60.6% Agree) were in agreement that the provision of boreholes has helped to improve personal hygiene in their households.

**Figure 9: Poor hygiene conditions before borehole provision in communities**




**Source: Fieldwork, 2006**

**Table 2: Boreholes provision helping to improve personal hygiene in households**

| Response | Frequency | Percentage |
|---|---|---|
| Strongly Agree | 328 | 27.3 |
| Agree | 727 | 60.6 |
| Neutral | 52 | 4.4 |
| Disagree | 70 | 5.8 |
| Strongly disagree | 23 | 1.9 |
| Total | 1200 | 100.0 |

**Source: Fieldwork, 2006**

As shown in Table 3, 95.6% of survey respondents (19.6% Strongly Agree and 76.0% Agree) affirmed that the

provision of boreholes in their communities is promoting regular face washing among both children and adults in households. This practice led to the eventual eradication of trachoma disease from Atebubu and the Afram Plains Districts. The health and time gains have contributed to improved labour productivity, economic empowerment and eventual reduction in poverty.

**Table 3: Boreholes provision promoting regular face washing among children and adults in households**

| Response | Frequency | Percentage |
|---|---|---|
| Strongly Agree | 235 | 19.6 |
| Agree | 912 | 76.0 |
| Neutral | 10 | 0.8 |
| Disagree | 13 | 1.1 |
| Strongly Disagree | 30 | 2.5 |
| Total | 1200 | 100.0 |

**Source: Fieldwork, 2006**

## 5. Discussion

Studies have increasingly shown that the daily availability of potable water in rural households is very crucial for diseases control and eradication, and as such potable water scarcity in homes adversely impacts individuals and households as well as community well being. Potable water availability and use is a major factor in disease control. Also much quantities of potable water are needed for personal hygiene promotion, especially for bathing, and laundry (Mba and Kwankye, 2007).

While prevalence of poor hygiene can be attributed to the non-availability of potable water or its insufficiency, some diseases directly caused by poor hygiene are diarrhea and others such as dysentery and typhoid related to ingestion of faecal-related contaminated water. It also plays a vital role in epidemics and contributes to endemic diseases from pathogens. There are therefore strong links between water supply, hygiene and disease (Pruss-Ustun, et, al, 2008).

A major source of water-related infections is through ingestion of contaminated water. Poor quality water also plays a vital role in epidemic and contributes to endemic diseases from pathogens. There are therefore strong links between water supply, hygiene and disease. Contaminated water and lack of adequate quantities of water for personal hygiene are also causative factors of waterborne/related ailments such as infectious hepatitis, diarhoeal diseases, typhoid, and guinea worm (Robilliard, 2009; Bartram, 2008; Jamison, et al, 2006).

The prime source of disease in the developing world being poor quality drinking water, 80% of morbidity cases are water-borne or water-related, with this disease-burden most acute among the poor. As an example, it is estimated that every year, there are four billion episodes of diarrheal disease, with two million child fatalities globally (Prahalad, 2010; WHO/UNICEF, 2010). The provision of potable water facilities worldwide have proven to be very effective in eradicating, controlling and in many instances averting infectious water-borne/related diseases. Investments in this area in particular have proved to be life saving and have facilitated access to potable water's threshold of 20 litres a day, improved personal hygiene and improved sanitation in many households (Robilliard, 2009; Davidson & Esubalew, 2009).

Globally however there is extreme deprivation so much that the over 1.1 billion people classified as being without potable water do not have access to even 5 litres of water a day. It is estimated that if the targets set under the Millennium Development Goals for Water and Sanitation are attained by year 2015 that will result in over 203,000 less mortalities by children and the saving of over a million children's lives over the next decade (UNDP 2006; Fay, et, al, 2005; Sachs, 2005).

Documented studies have shown that providing potable water facilities can avert child mortalities by 50% annually. Meanwhile 272 million additional school days will be gained to facilitate effective participation in school by children; 320 million productive days gained for the age group of 15-59. It has also been estimated that there are gains of additional 1.5 billion healthy days for children under-five years of age. In aggregate these give yearly productivity improvements and earnings amounting US$9.9 billion. Again, an estimated $15 billion as total economic benefits virtually accrues to Sub-Saharan Africa (Pruss-Ustun, et al, 2008; Bartram and Hutton, 2008). The ultimate however will be to facilitate the release of rural dwellers from water borne and water-related diseases that continually deprives them of their well being. An estimated total of 20 billion working days per year accrues and used as a result of time savings from potable water facilities provided globally. It is estimated this gives a payback on human productivity amounting to an estimated US$63billion annually (World Bank, 2010; Pruss-Ustun, et al, 2008; UNDP, 2006).

It is a well established phenomenon that as people become well-educated, wealthier and healthier, they

pursue and create a living environment devoid of shortage of clean water. Thereby, they facilitate the emergence of economic growth (Quentin, 2007; UNDP, 2006). Thus, as depicted on the conceptual framework (Figure 1), being provided with a borehole is a strong indicator of substantive freedom achievement. However, globally, several millions of rural populations are experiencing the non-availability of potable water infrastructure. For millions of rural women, it is still a tragedy as they continue to endure the deprivation, shame, physical discomfort and insecurity of not having access to any potable water facility (World Bank, 2010; La Frenierre, 2009; Blackden and Wodon, 2006).

Again, as depicted in the conceptual framework (Figure 1), Guinea worm and Trachoma infections illustrate the wider interaction between potable water provision, water-related diseases eradication, health regained and poverty eradication and wealth creation. These illnesses work concurrently to reduce real incomes, increase household expenses and limits wealth creation aspirations. For example, illness in poor communities due to water borne/related diseases causes low farm productivity, which also leads to poor income earnings and perpetuation in poverty. Because these poor rural people do not have medical insurance policy they have to foot all their medical expenses (WHO/UNICEF, 2010; Quentin, 2007; Sachs, 2005).

In terms of access, the minimum potable water needs of individuals has been estimated at 20 litres daily per individual, and this should be available from a distance of one kilometer from a person's place of residence. It is deemed this quantity of potable water should be sufficient for a person's daily drinking and personal hygiene purposes. When laundry and bathing needs are added it raises the water needs per capita to about 50 litres daily. Thus it is considered abnormal if people cannot access this minimum quantity of potable water each day and they become constrained, and their physical well being and personal dignity comes into question (WHO/UNICEF, 2010; UNDP, 2006).

While in this study the tragedy of 'no access' to potable water has been resolved through the provision of boreholes in and around rural communities, the observation however is that the majority of the world's population and especially those living in developing countries fall far below even the 20 litres daily basic need threshold for water, and for many millions in rural communities this is a permanent life deprivation. The current reality globally is that about 1.1 billion people live more than the one kilometer threshold of distance to a potable water source, and the quantity of water they use most often fall below five litres daily and is of poor quality (Davidson and Esubalew, 2009; Mays, 2007).

Accessing potable water should be in or around communities and is indicated as being within one kilometer from a user's house (UNDP, 2006). This factor is a critical point of interest because it is a benefit for quality of life improvement because of the substantial time gains and as well as being spared the drudgery and tedium of conveying water from its source to households (La Frenierre, 2009; Blackden and Wodon, 2006).

When the time gains are valued, time saved from searching for and fetching water for households underlines several other social benefits. Results from many studies abound to suggest that potable water provision and improved hygiene practice through effective face washing is effective in producing great reductions in trachoma prevalence (WHO/UNICEF, 2010; Bartram and Hutton, 2008; UNDP, 2006). As proved in this study, guinea worm is also curable and preventable only through consistent patronage of water of improved quality such as is produced from boreholes, and that constitutes all that is needed to interrupt the cycle of transmission, as indicated by results from this study.

Yet still water-related diseases do constitute a heavy economic burden for the rural poor, with negative impacts such as adult mortalities, lost of man-labor days, and as it affects the health of children. It is now common knowledge that potable water availability through boreholes provision in rural communities brings along several benefits which includes regaining of lost health capabilities, time gains from no more going searching for water for hours, and improved personal hygiene. When this situation is sustained, then a rare process of self-induced progressive transformations eventually emerge with time and manifests as improved quality of life for gradual reduction in poverty (Robilliard, 2009; Fay, et al, 2005).

In that transformative process, as shown on the conceptual framework (Figure 1), health regained from the ceasure of bouts of diarrhea and termination of re-infection by guinea worm are translated into the highest level of social and economic returns per person, per family, per household and per community (Pruss-Ustun, et al, 2008; UNDP, 2006). These are invisible, powerful synergies released into the human development process through just water availability by the provision of boreholes in deprived rural communities. The salient truths being that when potable water is made available in poor, deprived communities, the wheel of progressive development begins to turn and with good water management and sustainability practices human and community growth and development aspirations are nurtured into concrete realization(Singh, 2009; Ademiluyi & Odugbesan, 2008).

Most often, in communities provided with boreholes and good maintenance culture sustained, good personal hygiene practices tend to flow along, especially if buttressed by extensive community level education (Fisher, 2011; Fosenka, 2008). Therefore, the core challenge in rural poverty reduction efforts is the need for central government to proactively provide improved potable water infrastructure, typically boreholes with hand pumps, in quantities so as to reduce the over reliance on traditional surface water sources which are contaminated and

perpetuates diseased conditions in individuals, households and communities (World Bank, 2010).

However, in many developing countries which have proactively adopted boreholes to solve the need for potable water infrastructure in their rural communities, sustainability has emerged as a major challenge to rural folks and a major concern to national water supply and management authorities. Two major sustainability elements which are technical and financial capacity are not available or adequate at local level to facilitate effective maintenance and repairs of boreholes. So when boreholes break down, most often, people turn back to their traditional surface sources – rivers, streams, and ponds, in order to fill the water-need gaps created. Because almost all these traditional surface sources are contaminated with opportunistic disease parasites, new diseases cycles are reactivated in households which patronize them and do not treat their water collected (Mays, 2007; Jamison, et al, 2006).

Poor government decentralization arrangement for maintenance and repairs of rural boreholes has put undue pressure on poor communities to support themselves somehow as they helplessly witness the rapid deterioration of their boreholes which no longer provide the intended service (Davidson and Esubalew, 2009; Harvey and Reed, 2004). By implication, if much seriousness is not attached to ensure that effective sustainability measures are an integral part of the design and execution of the rural boreholes provision agenda, the initial health, personal hygiene gains made, and the emerging human development and household transformation processes will not be viable. Boreholes breakdowns will only reverse any significant gains made in health and personal hygiene practices.

Sustainability measures therefore are indispensable. Quintessentially they serve as the vital fulcrum around which any enduring progress in good health, and improvements in personal hygiene practices revolves to ensure lasting gains in individual, household, community and national growth and development efforts and aspirations.

## 6. Conclusions

The study has shown how boreholes provision in the Atebubu and Afram Plains Districts positively impacted health and hygiene practices for the well being of the rural inhabitants. In the study area, domestic water supply requirement far exceeds the minimum required for bathing, laundry, cooking and drinking. Most often the quantity of water needed for both drinking and cooking is collected at the same time from the same source. However, more water is needed in households to facilitate personal hygiene practices, which are so indispensable to ensuring continual well being.

The unavailability of potable water in rural households prevents or limits personal hygiene practices, with the concomitant effects of diseases such as chronic diarrhea, and yaws. Water of poor quality from surface water sources when ingested is also known to be the cause of infectious diseases and creates linkages in epidemics and contributes to endemic diseases. There are therefore strong links between water supply, hygiene and diseases. Contaminated water and lack of adequate quantities of water for personal hygiene causes waterborne/related ailments such as guinea worm, typhoid, and dysentery. Where a significant proportion of households consume water from surface sources it is indicative of a substantial risk to the health of the members of the households (UNICEF, 2010; Mba and Kwankye, 2007).

Findings from this study showed 96.9% of respondents indicated complete eradication of guinea worm from their communities resulting in freedom from the incapacitating disease; 87.4% indicated improved health. Also, 87.9% of respondents indicated boreholes facilitated improved personal hygiene. Boreholes provision helping to improve infant and child health was indicated by 89.0% of respondents. Counterfactual evidence from the Control communities showed 71.1% of respondents indicated very poor hygiene practices prevalent.

The study further revealed that within geographic space, providing boreholes and their consistent patronage facilitates the emergence of substantive freedoms which constitute intangible wealth that creates opportunity for people to reduce poverty and eventually realize their potentials in life.

## References

Abadzi, H. (2007). Absenteeism And Beyond: Instructional Time Loss And Consequences. The World Bank Independent Evaluation Group: Policy Research Working Paper # 4376. The World Bank, Washington, DC.

Ademiluyi, I.A., Odugbesan, J.A. (2008). Sustainability and Impact of community water supply and sanitation programs in Nigeria: An Overview. Africa Journal of Agricultural Research Vol.3 (12), pp.811-817, December, 2008.

Bartram, J. (2008). Flowing Away: water and health opportunities. Bulletin of the World Health Organization, January 2008, 86(1). WHO, Geneva, Switzerland.

Bartram, J., Hutton, G. (2008). Global Costs of attaining the Millennium Development Goal for water supply and sanitation. Bulletin of the World Health Organization, January 2008, 86(1). WHO, Geneva, Switzerland.

Blackden, M.C., and Wodon, Q. (2006). Gender, Time Use And Poverty In Sub-Saharan Africa. World Bank

Working Paper No. 73.World Bank, Washington, DC.
Davidson S.A., Esubalew A. A. (2009). Experiences from Ethiopia and Nigeria Infrastructure Provision and the Attainment of Millennium Development Goals (MDG) in Decentralized Systems of Africa. Conference on the Role of the Sub-National Jurisdictions in Efforts to achieve the MDGs. 7-9 May 2009. Abuja, Nigeria.
Fay, M, Leipziger, D, Wodon, Q, & Yepes, T. (2005). Achieving Child – Health-Related Millennium Development Goals: The Role of Infrastructure. World Development 33 (8): 1267 -84.
Fisher, J. (2011), Operation and Maintenance for Rural Water Service. WELL Briefing Note 15. Water Engineering and Development Centre (WEDC), Loughborough University, Leicestershire, UK.
Fosenka, H.P.S.S. (2008). Rural Water Supply sustainability And Impact. Access To Sanitation And Safe Water: Global Partnerships And Local Actions. 33rd WEDC International Conference, Accra, Ghana, 2008.
Ghana Health Service (GHS) (2007). Annual Report. Ghana Guinea Worm Eradication Program (GWEP). Ghana Health Service, Accra.
Ghana Statistical Service (GSS). (2000). Poverty Trends In Ghana In The 1990s.
Statistical Service, Accra.
Government of Ghana (2007). National Water Policy. Ministry of Water Resources, Works And Housing, June 2007, Accra.
Guiseppe, I. (2006). The Power of Survey Design. The International Bank for Reconstruction and Development / The World Bank, Washington, DC.
Harvey, PA., Reed, RA. (2004). Rural Water Supply In Africa: Building Blocks For Handpump Sustainability. WEDC, Loughborough University, U.K.
Jamison, DT, Breman, JG, Measham, AR. (2006). Disease Control in Developing Countries: Chapter 41: Water Supply, Sanitation, and Hygiene Promotion, Sandy Cairncross and Vivian Valdmanis. 2nd Edition. World Bank, Washington, DC.
Kreuger, LW, Neuman, WL, (2006). Social Research Methods - Qualitative and Quantitative Applications. Pearson Education, Inc, Boston, USA.
La Frenierre, J, (2009). The Burden of Fetching Water: Using Caloric Expenditure as an Indicator of Access to Safe Drinking Water - Case Study - Xieng Khouang Province, Lao PDR. University of Denver, USA.
Mays, L.W. (2007). Water Resources Sustainability. The McGraw-Hill Companies Inc, USA.
Mba, CJ., Kwankye, SO. (2007). Population, Health And Development In Ghana: Attaining The Millennium Development Goals. Sub-Saharan Publishers, Accra, Ghana.
Mertaugh, MT, Jimenez, EY., Patrinos, HA. (2009). The Global Challenge In Basic Education: Why Continued Investment In Basic Education Is Important. Conference Edition. World Bank Independent Evaluation Group, World Bank, Washington, DC.
Nussbaum, M.C. (2005). Women And Human Development – The Capabilities Approach. Cambridge University Press, New York.
Prahalad, C. K. (2010). The Fortune At The Bottom of the Pyramid – Eradicating Poverty Through Profits. Pearson Education, Inc. Wharton School Publishing, New Jersey.
Pruss-Ustun, A, Bos, R, Gore, F, Bartram, J. (2008). Safer Water, Better Health: Costs, benefits and sustainability of interventions to protect and promote health. WHO Press, Geneva. Switzerland.
Quentin, W. (2007). Growth and Poverty Reduction: Case studies from West Africa. World Bank Working Paper # 79, Washington, DC.
Robilliard, JL A, (2009). The Complementarity of MDG Achievements: The Case of Child Mortality in Sub-Saharan Africa. The World Bank Development Economics Prospects Group; September 2009, Policy Research Working Paper 5062. World Bank, Washington, DC.
Sachs, JD, (2005). The End of Poverty: How we can make it happen in our lifetime. Penguin Group Inc., New York.
Singh, K. (2009). Rural Development: Principles, Policies and Management. 3rd Edition. Sage Publications, New Delhi, India.
UNDP, (2006). Human Development Report 2006, Beyond Scarcity: Power, Poverty and the global water crisis. Palgrave Macmillan Publishers, New York.
--------- (1997). Human Development Report: Human Development to Eradicate Poverty. Palgrave Macmillan Publishers, New York.
--------- (1990). Human Development Report: Concept and Measurement of Human Development. Palgrave Macmillan Publishers, New York.
WHO/UNICEF (2010). Progress on Sanitation And Drinking Water – 2010 Update. WHO/UNICEF Joint Monitoring Program For Water Supply and Sanitation (JMP). WHO Press, Geneva, Switzerland.
World Bank (2010). Africa's Infrastructure - A Time for Transformation. The International Bank for Reconstruction and Development /World Bank, Washington, DC.

---------- (2006). World Development Report 2007: Development and the Next Generation. The World Bank, Washington, DC.

---------- (2001). World Development Report: Attacking Poverty, Opportunity, Empowerment, and Security. The World Bank, Washington, DC.

World Vision Ghana (2007a). Atebubu Area Development Program, Design Document. World Vision Ghana, Accra.

World Vision Ghana (2007b). Afram Plains Area Development Program, Assessment Document. World Vision Ghana, Accra.

World Vision Ghana (2003). World Vision Ghana Rural Project (GRWP) Phase III Final Evaluation Report. World Vision Ghana, Accra.

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