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Research Article

Assessing Community Perceptions on Implication of Water Resource Degradation to the Access of Wash Services: Case of Ankobra Basin, Ghana

SERIBA KONARE[1]; OWUSU-SEKYERE OSEI[2]; Karounga KEITA[3]

[1]Technical Officer of Wetlands International Sahel, Mali
[2]Director, Conservation Foundation, Ghana
[3]Director of Wetlands Office in Sahel

Correspondence should be addressed to SERIBA KONARE, *skonare@wetlands-saheloffice.org*

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Abstract Government of Ghana has put huge effort to assure access to Water, Sanitation and Hygiene (WASH) services to all citizens in the country. It has strengthened legislation and allocated more budget to wash sector. Unfortunately, lack of proper actions to prevent water resource degradation risk to create a setback in access to WASH services in Ghana. We have set up this study in order to understand the view of citizens on the link between water resources protection and sustainable WASH. We carried out a survey to find out if people understand contribution of forest, wetlands to purify surface water, and we also monitored chemical parameters of domestic water. Two-third of water quality samples were deemed as high risk, and definitely unsafe or probably unsafe to drink.

Keywords *Gold mining; WASH; Wetlands; AKVO Caddisfly and chemical parameter*

1. Introduction

The vision of the water sector is for “all people living in Ghana have access to adequate, safe, affordable and reliable water service, practice safe sanitation and hygiene and that water resources are sustainably managed.” (Water Sector Strategic Development Plan 2011-2025) In 2009, the Government of Ghana acknowledged that access to water and sanitation should be treated as a right and is a means to improving living standards of people, with the understanding that right to water does not mean free services. Since then, Ghana has made headway with a continuous rise in the proportion of the population using improved drinking water sources and even exceeding the Millennium Development Goal target for safe water (Service, 2014). However, there are visible disparities between urban and rural, served and underserved access to safe water and issues of gender inequities. In terms of sanitation, access to improved sanitation increased, however, open defecation is still practiced (whether in minority or majority) in underserved communities in Ghana. Ghana has made progress through construction of Water, Sanitation and Hygiene (WASH) infrastructures (water pumps, improved public toilets, extension of tap networks, etc.), and increased budgets in WASH sector (Adjasi, 2007). Unfortunately the strides of progress are threatened by a lack of protection of water resources (Chapman, Tonts, & Plummer, 2015) (I, 2010). In Ghana, the main

reason of water resources degradation is first and foremost illegal mining, other key contributors are poor sanitation (disposal of faecal and solid waste in waterways) and farming with agrochemicals.

In 1989, the Government of Ghana lifted the ban on small-scale gold mining. Small-scale gold mining provides jobs to unskilled rural people, with price for gold increasing with global demands for electronics (Nyame, 2010) (Tuokuu, Gruber, Idemudia, & Kayira, 2018). Though, the economic asset of small-scale mining cannot be denied, the environmental costs are significant. The artisanal gold mining sector uses mercury to recover minute pieces of gold that is mixed in soil and sediment. Surface and ground water are becoming polluted; good quality water is threatened, driving up the cost for water for service levels. Do communities understand the link to the protection of water resources and sustainable WASH services? We have carried out a survey to find out if citizens in communities around artisanal gold mining understand the contribution of forests, wetlands to purify surface water. We also monitored chemical parameters of domestic water to collect data on water quality and begin to understand degree of degradation.

2. Methodology

2.1. Study Area

The Ankobra River Basin is located between latitude 4° 50' N and 6° 30' N and longitude 1° 50' W and 2° 30' W. The basin is bounded to the east by the Pray Basin, to the north and west by the Tano Basin and in the south-east by the small coastal Butre Basin.

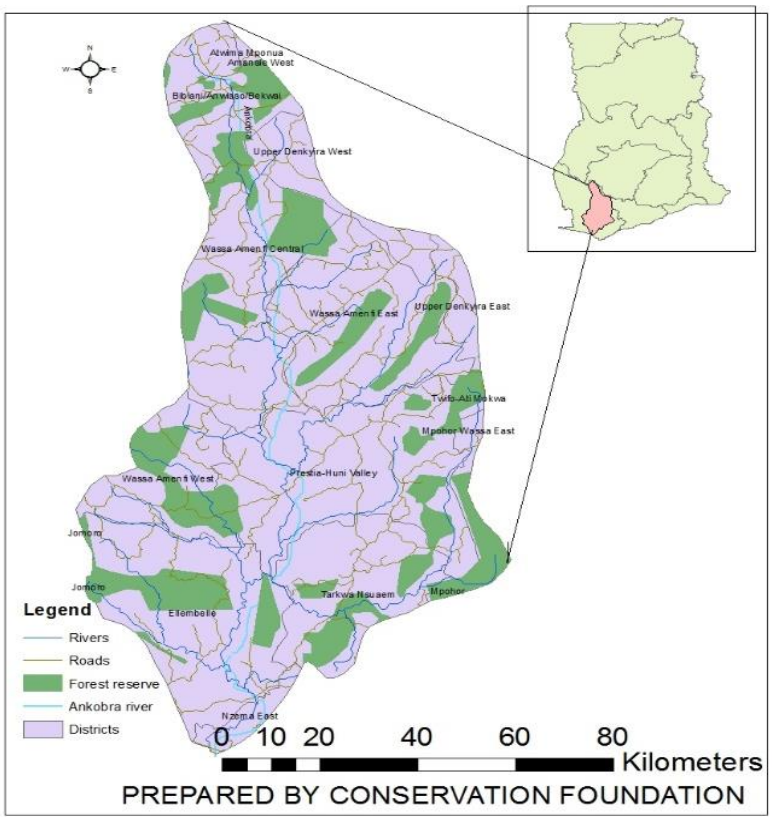

Figure 1: *Map of Ankobra Basin, prepared by Conservation Foundation*

The topography of the basin is characterized in the southern half of relatively flat land, which gives way in the mid to northern sections of the basin to characteristic rounded hills, which occasionally are also steep-sided. The hilly terrain is prominent around Wassa Akropong, a chain of hillocks forming

the north-eastern rim of the basin, south of Dunkwa and north of Awaso in the upstream north-western corner of the basin. The hilly terrain reaches an altitude of close to 500 m above sea level. The Ankobra River Basin belongs to the Western River System and covers an area of about 8,460 km^2. The river takes its source from the hills north of Basin (near Bibiani) and flows for about 260 km mostly due south before it enters the Gulf of Guinea at Asanta a few kilometres west of Axim. 27 communities living along the Ankobra River, downstream from artisanal mining activities.

2.2. Data Collection

The desk study reviewed existing studies and works performed in the field of Integrated Water Resource Management (IWRM) and WASH as well as the work already conducted or on-going in the study area. Major sources of information included review of academic work, reports and data from relevant ministries and institutions, including the Ministry of Water and Sanitation, Ministry of Environment, Ministry of Agriculture, and relevant water authorities.

Field questionnaires targeted community practices around water resources consumption, as well as hydrology of the area, catchment area (watershed), land use and community knowledge about the role of wetlands in restoring water quality.

Questionnaires aimed to gain understanding of the communities' awareness of issues around water conservation and management. While communities were not involved in the design of questionnaires and data collection tools, they were involved in survey activities as part of the overall effort to increase local capacity and awareness. In that sense, community leaders were briefed on objective of the study and contents of questionnaires. Local residents actively participated in collecting information. Community members from all 27 communities participated in this part of the study.

In terms of sampling, water samples were from hand dug wells, dug outs, boreholes with hand pumps, mechanized boreholes, streams and rivers. In total 39 water samples were collected from target communities. Samples collected followed the AKVO Caddisfly water sampling protocol, testing for Escherichia coli (E. coli), Nitrate, Alkalinity, Hardness, pH and Electrical Conductivity. Sample results are recorded on-the-spot, with GIS location of where sample was taken.

3. Results

3.1. Characteristics of Respondents

400 community members participated in questionnaires. The goal was to get cross-sectional representation of both sexes and all age groups, to see if these characteristics play a role in understanding of water resources management. 53% of respondents were male (214), and 47% were female (186).

Majority of respondents were farmers (38%), and even those engaging in other activities managed farms. Fishing was also a secondary source of occupation at the coastal areas. Other occupations included traders (26%), artisans (10%), and other jobs (26%).

3.2. Source of Drinking Water

Results found that majority of the people depend on groundwater, surface water is considered unsafe because of the artisanal mining activities (legal and illegal) in the area. A few communities depend on water from wetlands.

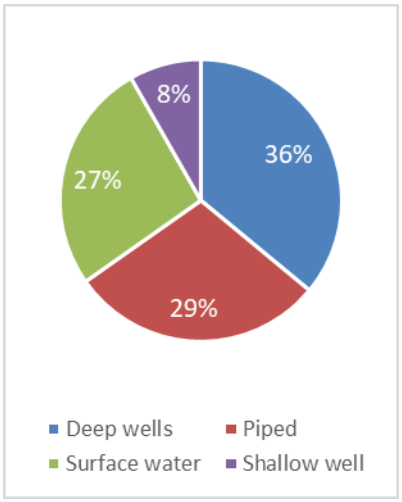

Figure 2: *Sources of drinking water (n=400)*

3.3. Knowledge of Community about Importance of Water Resource Protection

Below results on community awareness and understanding of water resource protection is discussed

Value of Wetlands to protect water resources

Wetlands for many years has been perceived as "waste lands" or areas that serve for breeding mosquitoes. As such, they were dredged to facilitate drainage of the water, reclaimed for other uses, or used as dumping grounds for solid and liquid waste. Wetlands resources, such as fish, reeds, mangroves and thatch materials were harvested indiscriminately without regulations on their exploitation. The study tried to find out perceptions among the community members about wetlands. Findings indicate that many people still hold similar thoughts of the insignificance of wetlands. A few respondents did understand the importance of wetlands. We probed further to find out if there have been any educational programs on wetlands in their community? Only one community had received any training. Majority did not understand the need to protect wetlands and water resources.

Pollution from artisanal mining

The illegal mining activities produce noise, dust and visual pollution. The operations of the illegal mining create environmental damage: contamination from leakage of chemicals affect human, animal and aquatic life that depends on the water sources. Especially the use of mercury threatens livelihoods that depend on water resources downstream.

Environmental stresses from mining

Mining changes the original structure of the ground, and areas are affected by the occurrence of landslides and floods.

3.4. Chemical parameter monitoring

Below results from water quality sampling are presented and implications discussed. The sample size is 39.

Nitrate/Nitrite Test

For Nitrate/Nitrite, 95% of samples had values below 10mg/l, which is within the permissible limits as set by the World Health Organization. A few were just above the limit at (10.3 and 10.7mg/L). Results implying that chemical contamination from fertilizer is low in the area. It is important to note that water quality samples were taken *after* rainy season, which means chemicals might have been washed away. To be certain on that, another test is being considered to be done during the dry season to help answer the question.

Alkalinity Test

The World Health Organization sets the permissible range for alkalinity of drinking water between 20 – 200mg/L. 55% of samples has permissible levels of alkalinity, and the other half of samples measured below 20mg/L, which means it may not slightly corrosive and not ideal for drinking. The samples that measured low alkalinity were taken from surface water (rivers/stream), and in 4 communities these are the main source of drinking water.

Hardness, Calcium T2 Test

None of the samples fell within the taste threshold for calcium in drinking water 100-300mg/l. Majority (95%) had values below 100mg/l.

Electrical Conductivity Test

The World Health Organization sets electrical conductivity levels drinking water to 0ms/cm – 800ms/cm as ideal, but could go up to 1,500ms/cm. All samples had values falling within the ideal range, and only 2 samples above 800ms/cm.

pH Value Test

The World Health Organization sets the ideal pH for drinking water as neutral, between 6.5-8.5. Majority of samples (89%) fell within permissible range, while a couple of sample (4 samples) had pH values less than 6.5, which means slightly acidic.

Faecal Contamination Test

For faecal contamination, samples are measured for the presence or absence of E. coli. For E. coli, the permissible limit is “absent”. It is not to be present in any form in drinking.

Analysis of water quality results

About one-third of water sample are probably safe and/or safe to drink, these samples were taken from in majority taken from boreholes and hand dug wells. About half the samples were taken from perceived protected sources (borehole or hand dug well), and this is where our interest lies: what is the quality of water from these protected sources.

Communities understand that drawing water from rivers, streams and dug outs present high risk, however, in 5 communities; no other alternative sources are available for drinking water.

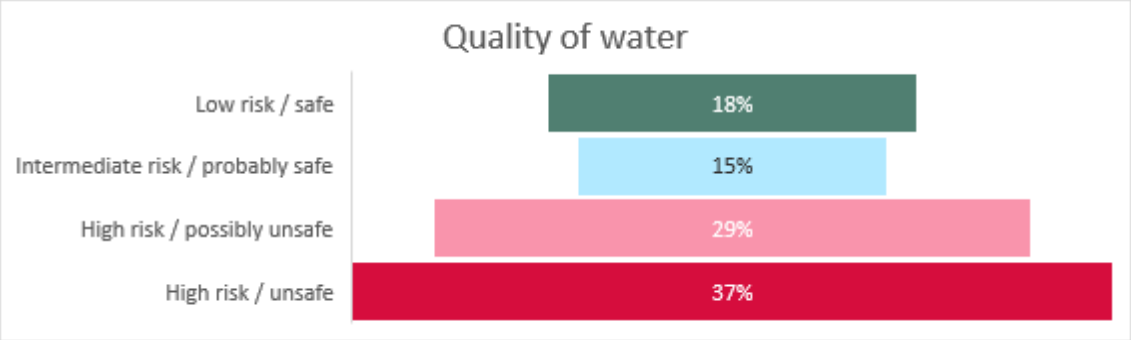

Figure 3: *Degree of risk based on samples (n=39)*

4. Conclusion

That study shows that most people living within Ankobra basin don't have much information on the implication of water resource degradation to their health; but once one start to discuss issue (effect on the health) they get really sad and start to blame policymakers as responsible of water resources degradation. Illegal Mining is considered as the main reason of water body degradation at the same time people living within Ankobra basin accept illegal mining because its their main source of employment. Use of Akvo Caddisfly test, was much appreciated by Ankobra citizen, because it is simple and it's a substitute of complicated laboratory test.

Acknowledgement

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