Fact Sheet

Community-Led Water Quality Monitoring Framework for Lake Bosomtwe

Background

Lake Bosomtwe is a valuable and beautiful natural resource that is used and enjoyed by watershed residents as well as tourists. However, since human activities such as fishing, bathing, clothes washing, and refuse disposal in and around the lake have had adverse impact on the lake, the need to prevent further environmental degradation of the lake basin and to improve the quality of the water in the lake has been identified. Efforts to promote sustainable livelihoods by using community-based approaches have subsequently been made.

Since 2011, UNESCO in partnership with the Ministry for Water Resources, Works and Housing and the Office of Otumfuo Osei Tutu II, Asantehene, has been implementing the project 'Sustainable Management of Lake Bosomtwe in the Ashanti Region of Ghana' with support from the Spanish Ministry of Agriculture, Food and Environment to help address some of the threats faced by the lake.

Friends of the Earth-Ghana was selected to help develop a community-based water quality monitoring framework for the lake. Stakeholders were brought together to agree on a community-based long term monitoring framework that requires the cooperation of all the communities and their citizens. The stakeholders will use three approaches namely (a) water quality monitoring by environmental clubs; (b) discussion of results with communities; and c) record keeping at both the school and the District Assembly Offices levels. Through these efforts, enough data on water quality in Lake Bosomtwe will be gathered in order to ascertain the effect of human activity on the lake. The conservation of the lake will thus be the topic of discussions in all lakeside communities and this will lead to pragmatic steps towards the conservation of the lake.

Why community-led water quality monitoring?

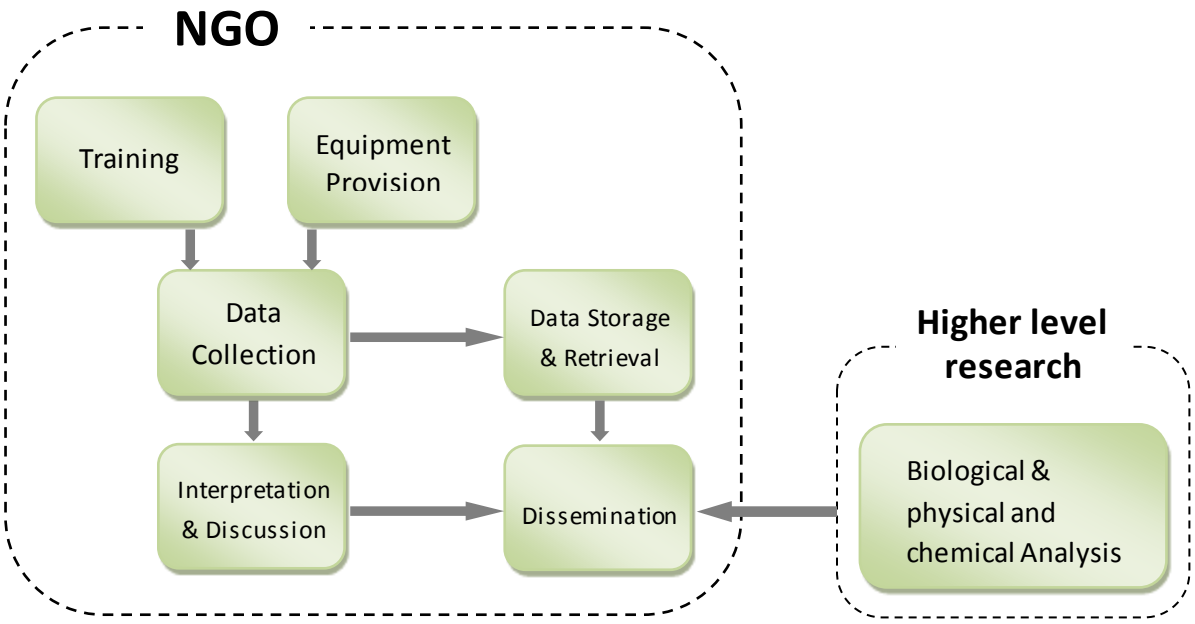
- Collective effort is vital to determine the status and trends in selected indicators of the condition of Lake Bosomtwe and the shoreline to enable managers to make better-informed decisions and to work more effectively with other agencies and individuals for the conservation of the lake.
- All community members are required to provide early warning signs of abnormal conditions to help develop effective mitigation measures and reduce costs of management.
- Regular water quality monitoring exercises are needed to provide data for better understanding of the dynamic nature and condition of Lake Bosomtwe and to provide reference points for comparisons with other, altered environments.

Aims of community monitoring by the environmental clubs

- To gather and manage the data on water quality and watershed conditions
- To engender community interest in issues affecting water resources
- To develop a sense of community ownership for the lake and its resources
- To create community awareness of the linkage between water quality and the health of the people
- To inform policy on the lake resources, livelihoods and the health of the people.

Conceptual framework of the water quality monitoring system

The system developed is outlined in the chart below.



The components of the framework are:

i. Production of a map showing the monitoring locations and sites (pillars)
ii. Training of community groups consisting of the basic school pupils and supervising teachers in environmental clubs formed in basic schools within the lake basin. The objective of the training is to build the capacity of the environmental club members to enable them carry out the following activities:
    1. Water sampling
    2. Identification of variables
    3. Recording of observations
    4. Interpretation of observations in the context of lake water quality
    5. Dissemination of information
iii. Provision of basic scientific equipment required for carrying out the enumerated activities
iv. Regular water quality data collection (at least once a month)
v. Storage and retrieval system for the long term systems. Each of the two District Assemblies (Bosomtwe and Bosome Freho), has a computer with database designed to host the data gathered
vi. Dissemination of information at two levels
    1. Community support leaders facilitate regular discussion of findings and results with members of the communities

2. The two District Assemblies, NGOs, FBOs and other research institutions access the data for advocacy and higher level policy dialogues

vii. An overall supporting organisation (NGO) ensures that the system works. The NGO initiates trainings, helps to obtain equipment for the clubs, facilitates design and set-up of data storage system, sends information gathered and implications into policy debates beyond the level of the communities

viii. Incorporation of higher level research which operates independently of the community-led system to improve the overall framework. This is because data collected by the community can be validated by using higher level specific physico-chemical, biological and other water quality variables.

How the water quality monitoring programme has worked so far

Environmental club members were trained mainly on i) water sampling, ii) identification of variables, iii) recording of observations, iv) interpretation of observations in the context of lake water quality and v) dissemination of information. After the training they were provided with the necessary basic scientific equipment (Figure 1). Friends of the Earth-Ghana, the activity implementing partner identified the sites for monitoring and marked them with pillars (Figure 2), and produced a map showing the locations of all the monitoring stations around the lake (Figure 3). With the knowledge, equipment, information and tools obtained, data were collected by each community and a Microsoft Access (Figure 4) was employed for the purposes of data storage and retrieval.

Figure 1. Friends of the Earth-Ghana handing over the equipment for monitoring to members of a club

Figure 2. A pillar marking the location of site number 17

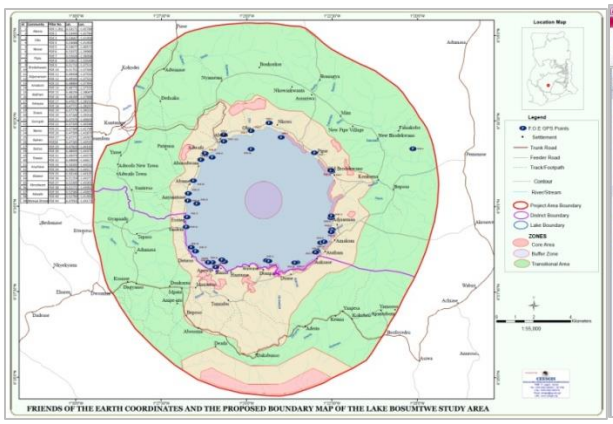


Figure 3.Locations of monitoring sites

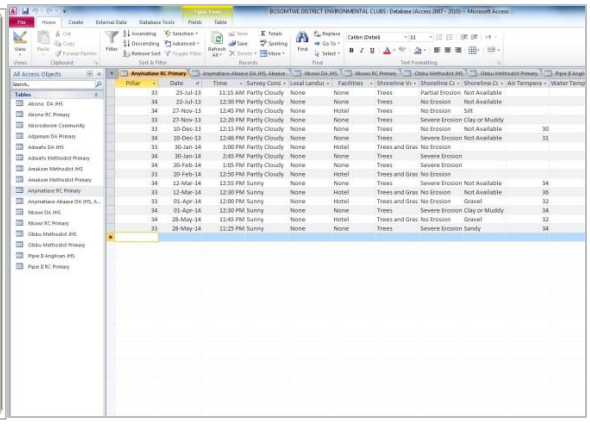


Figure 4. Data stored by Microsoft Access

Some benthic macroinvertebrates were identified as the core specimens or variables (Table 1). The specimens were divided into three groups: i) Group 1 contains pollution intolerant organisms, ii) Group 2 contains organisms existing in a wide range of conditions, and iii) Group 3 contains pollution tolerant organisms.

The presence of relatively high number of organisms that fall into Group 1 implies that the quality of water at the site is good. Where the number of organisms in Group 3 is significantly higher than those in the other two groups the water is described as polluted. External factors that influence the presence of organisms at a particular site are indicated in Table 1.

	BENTHIC MACROINVERTEBRATES			**PHYSICAL PARAMETERS**
	GROUP 1 ***POLLUTION INTOLERANT ORGANISMS***	**GROUP 2** ***ORGANISMS EXISTING IN A WIDE RANGE OF CONDITIONS***	**GROUP 3** ***POLLUTION TOLERANT ORGANISMS***	
ORGANISMS	Caddisfly nymph	Dragonfly nymph	Pouch (and other snails)	Air temperature
	Stonefly nymph	Crayfish	Leeches	Water temperature
	Mayfly nymph	Scud	Aquatic worms	Turbidity
	Dobsonfly larva	Clams	Blackfly larva	Rainfall
	Riffle beetle adult	Damselfly nymph	Midge larva	
	Water penny beetle larvae	Beetle larva		
		Sowbug		
		Cranefly larva		
SUPPLEMENTARY VARIABLES	**SURVEY CONDITIONS**	**LOCAL LANDUSE/ FACILITIES/ VEGETATION**	**SHORELINE CONDITIONS**	
	SUNNY	Crop farming	No Erosion	
	PARTLY CLOUDY	Piggery farm	Partial Erosion	
	CLOUDY	Refuse Dump	Severe Erosion	

	RAINY	Hotel	Boulders	
		Public Toilets	Gravel	
		Trees	Clay/Muddy	
		Grass	Sandy	
		Forest	Silt	

Table 1. Core and Supplementary Variables for Community Monitoring

To help the club members in their understanding of the different organisms in the three groups, a benthic macroinvertebrates ID chart was produced and distributed to the environmental clubs (Fig. 5).

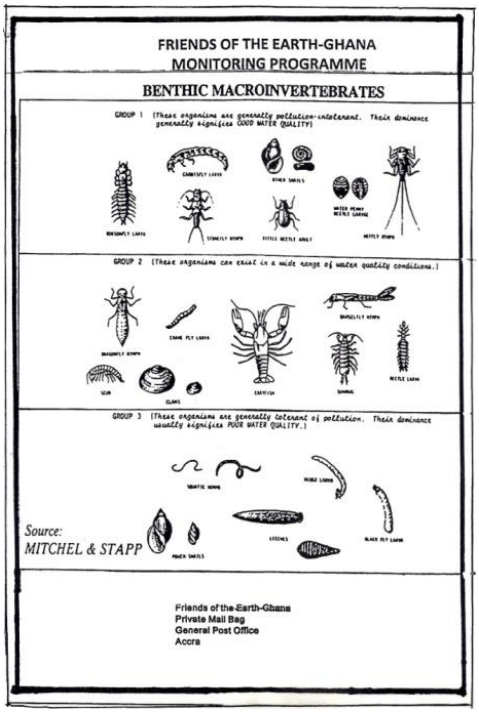


Figure 5. The three Groups of benthic macroinvertebrates in an ID chart

Observations

A few organisms in Group 1 were found at the sampling sites in most communities. Only Abaase community had a significant number of Water Penny Beetle larvae, a species in Group 1 (See Figure 6). The community had other organisms in Group 2 and 3, but not as many as the Water Penny Beetle larvae. From these findings, it could be inferred that lake water around the sampling location did not have major pollution problems. In contrast, Esaase community had a high number of midge larvae, but very few organisms in Group 1 were found. This could mean that there was a possibility of having water quality problems in that community (See Figure 7).

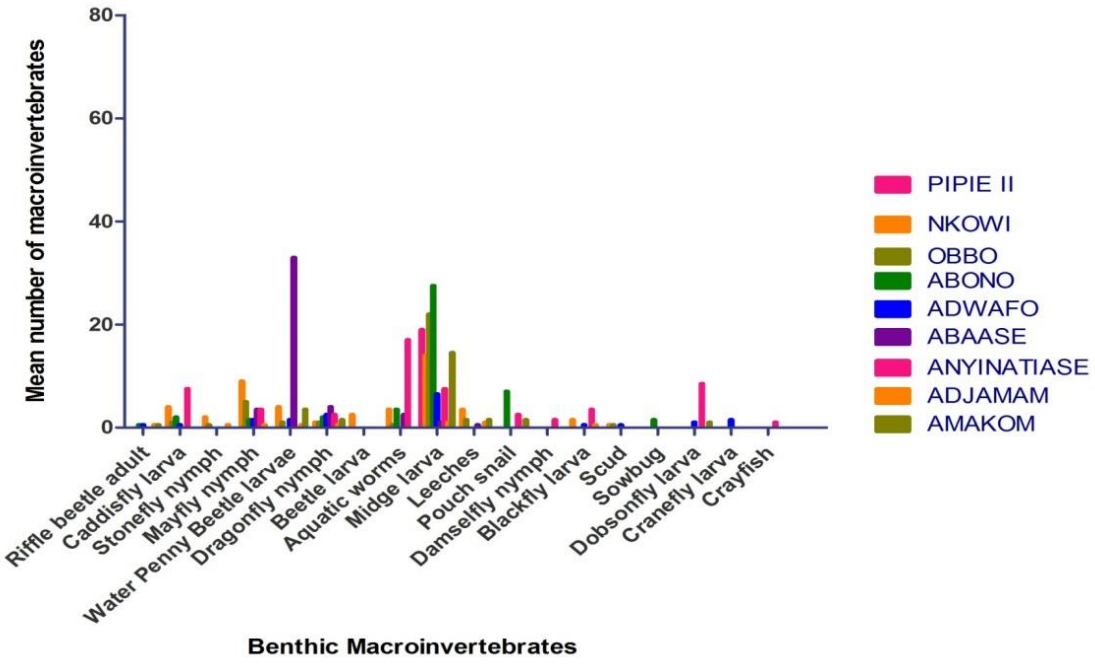


Figure 6.The mean numbers of macroinvertebrates in 9 communities

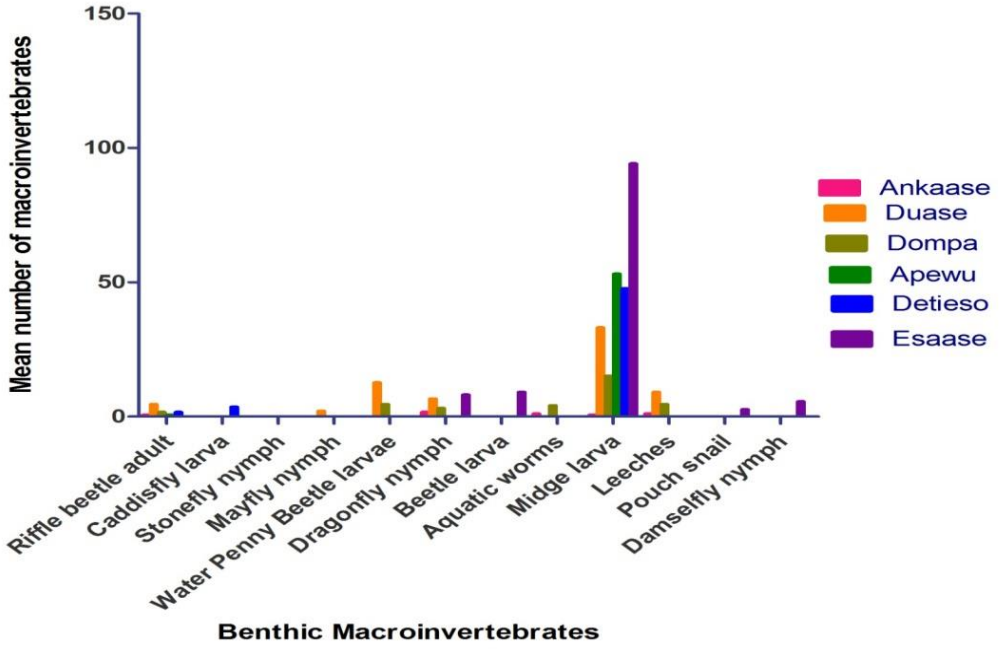


Figure 7.The mean numbers of macroinvertebrates in 6 communities

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