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# Conflict prevention and resolution mechanisms in water resources management: A perspective from the Black Volta Basin - Ghana

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## Abstract

Water as a resource is vital for both social and economic development. Notwithstanding these roles, the water resources availability of the Black Volta basin which is in a semi-arid region is threatened by climate change and high population growth rate. These challenges increase the competition for the limited water resources which could result in conflicts. This study therefore seeks to draw a framework for conflict prevention, conflict resolution and management within the Black Volta Basin. Data was obtained through focus group discussions, key informant interviews and questionnaire administration. From the study, it was revealed that the potential parties of conflict were mainly farmers and livestock owners. These conflicts were resolved mostly by the traditional authorities in consultation with the community. It was observed that traditional management system was one of the unique strengths of community level water resource management in the study areas. This suggests that the mobilization of local institutions and experiences is a key strategy in local level water resource management. From the findings, the communities have adopted series of interventions that are geared towards cooperation and consequently to curb conflicts in the use of water resources. Among such interventions are the use of the priority of water use doctrine, water allocation principle, introduction of coping physical strategies and the principle of negotiation.

**Keywords:** Conflict, Cooperation, Water resources, Black Volta basin

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## 1. Introduction

Agriculture and animal husbandry are the major economic activities of the riparian countries in the Volta basin (Lemoalle and de Condappa, 2010). These sources of livelihood are centered mainly on the water resources available in the basin. However, the currently high annual population growth rate of 2.5 % in the basin is said to lead to significant increase in water demand, particularly, for crops and livestock production in the near future (Andah et al., 2003). As water resources available per capita diminish due to population growth, pollution and over exploitation, the competition for water also exacerbates which is seen as a potential source of conflict (Huang et al., 2010; Carius et al., 2004). The issue of water conflict according to Falkenmark (1989) is linked to the prevalence of poverty, hunger and diseases of which the Volta basin is of no exception. Therefore this study sought to investigate how the available water resources of the basin are being utilized and managed to avert conflict.

## 2. Description of the study area

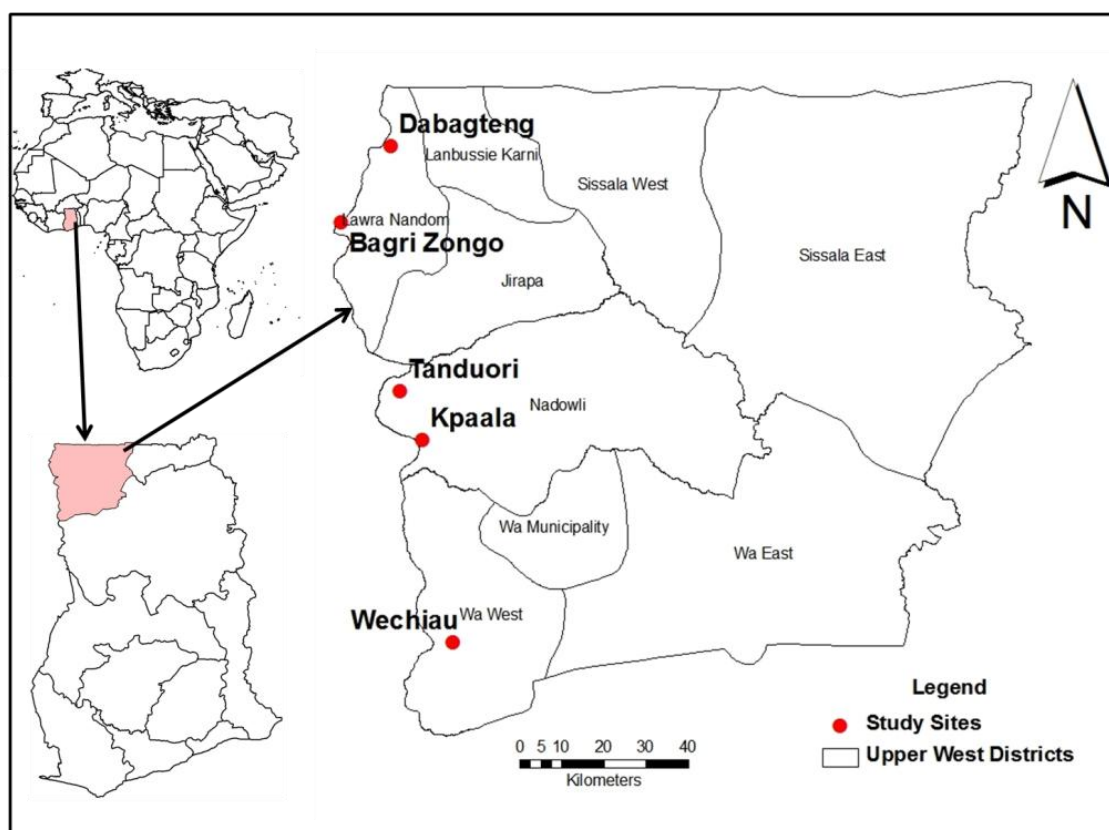


Figure 1. Map of study area showing study sites

The study was conducted in the Black Volta Basin, specifically the portion of the basin that falls within the Upper West region of Ghana (see Figure 1). Geographically, the region is located between longitude 1°25" W and 2°45" W and latitude 9°30" N and 11°N and covers a total land area of approximately 18,478km<sup>2</sup>. This forms about 12.7% of the total land area of Ghana. According to the 2010 Population and Housing census, the population of the region stands at 702,110. Out of this, males form 48.59% (341,182) and females constitute 51.41 % (360,928) (GSS, 2010). The temperature of the region ranges from 21°C to 29°C with a mean temperature of about 27°C. The northern part of the basin experiences only one major rainy season which starts in April and peaks in September. The rains normally end in October which makes rain-fed agriculture in the region unsustainable. Mean annual rainfall of the region is about 1150mm with mean humidity being 59 % (Barry et al., 2005). The potential evapotranspiration ranges between 1450mm and 1800mm (Andah et al., 2003).

### **3. Materials and Methods**

#### **3.1. Sources of data**

Data for the study has been obtained from two main sources, namely primary and secondary sources. The primary data were obtained through focus group discussions (FGDs), key informant interviews and questionnaire administration. A sample size of 300 respondents has been used for the questionnaire administration. Primary data has been obtained from stakeholders including Water User Associations (WUAs), Assembly men and opinion leaders within the study communities. The focus of data collected included issues related to perceptions about water resources, water use practices and involvement in the management of the resource, water related conflicts, local knowledge in water resource management, the responsibilities of traditional institutions, control and ownership of the resource as well as institutions that are involved in water management at the local level. Interviews with Heads of water agencies and NGOs were also undertaken. Secondary data were obtained from agencies such as Non-governmental organizations, Ghana Irrigation Development Authority, Water Resources Commission, Ministry of Food and Agriculture, Environmental Protection Agency and District Assemblies. By way of key informant interviews, data was obtained from the community leaders (Chiefs, Assembly men, etc.), Executives of WUAs (farmer and fishermen groups) as well as Executives of women groups. Where appropriate the key informant questionnaire was used to collect the required data. Key persons concerned with the management of water both at the regional and district levels were interviewed. Focus group discussions consisting of 8 members were organised in each study community to gather a wide range of information bordering on water resources management. The use of the questionnaire sought to gather information from all water users namely; farmers, pastoralist, fishermen as well as domestic users. Respondents were approached either on their farms or at home. During this time, the purpose of the study was made known to them after which consent was sort to start the interview.

## 4. Results and discussions

### 4.1. Uses of identified water resources

#### 4.1.1. Domestic water use

Three sources of domestic water were identified and these are boreholes, dugouts and the Black Volta River. From the study, 100% was recorded for all communities for the use of Borehole as the primary source of domestic water. This is due to the presence of boreholes throughout all the study communities. Water from the boreholes is supplemented with water from other sources such as dugout and the Black Volta River with an average of 19% of respondents supplementing using water from dugout and average of 34% using water from the river. The remaining 47% of the respondents do not use either dugout or river but rely solely on borehole for their domestic purposes. Among the study communities, functional dugouts were found in only Tanduori and Wechiau. Though Dabagteng had one dugout, it was not functional because its embankment had collapsed. Tanduori had one (1) dugout compared to the two (2) in Wechiau. Considering proximity of the primary water source, 84% of respondents said they live within 1km of the water source while the remaining 16% live within 1-3km. Comparing this to the WHO standards, 84% have good domestic water access, while 16% have poor access. The results show that 97% of respondents across the five communities had reliable borehole water supply.

#### 4.1.2. Livestock watering

The major sources of water use for livestock were dugouts, boreholes and the Black Volta River. Results of the study indicate that 52% of respondents use borehole for their livestock, 30% use the dugouts and 18% use the Black Volta River. From Figure 3, it is shown that 85% of the respondents in Wechiau use dugouts for livestock as compared to 65% in Tanduori. Due to the absence of dugouts in Dabagteng, Bagri Zongo and Kpaala, water use for livestock is mainly from boreholes. The use of the Black Volta is mainly by the people involved in cattle rearing. In Bagri Zongo, a greater proportion of the respondents are involved in cattle rearing thus the corresponding higher percentage (45%) in the use of the Black Volta. Interviews with key informants revealed that, the dugouts hold water during most part of the year with the water level reducing considerably towards the latter parts of the dry season. Proximity of livestock water sources are within 1km for 67% respondents, 29% between 1-3km and 4% between 3-6km. Therefore, majority of livestock keepers have access to water within a distance of less than 1km.

#### 4.1.3. Water for irrigation

As part of livelihood strategies, irrigation is practiced across all the communities. The major crops cultivated are tomatoes, okro and tobacco. Greater proportion of the respondents (60%), practice irrigation with water from the Black Volta River while 34% and 6% rely on dugouts and boreholes respectively. The 34% of the respondents who use dugout are mainly from Tanduori and Wechiau. The use of the Black Volta River for irrigation is predominant in Bagri Zongo, Dabagteng and Kpaala. This is due to the absence of dugouts in

these communities and thus the respondents rely on the Black Volta River for irrigation. In Bagri Zongo, intensive farming along the Black Volta cannot be overlooked. This has caused the removal of the vegetative cover causing siltation of parts of the Black Volta River. However, in Tanduori, irrigation is done with water from the boreholes and the dugouts but not the river. This community is not practicing farming at the bank of the Black Volta due to the sensitization given them on the effects of farming along the bank by Care Ghana. Majority of the respondents (73%) had their farms within less than 1km to the particular source of water for irrigation.

#### 4.2. Conflicts and conflict resolution mechanisms

The study has revealed that conflicts exist in the use of the available water resources among the same users or between competing users. These emerging conflicts are usually resolved by the traditional leaders, WATSAN and the community members as depicted in Table 1. This is an indication that the customary way of managing water resources based on conflicts resolution is still in use and effective (Maganga, 1998). Arising issues of conflict pertaining to either the use of the boreholes or dugouts were mostly settled by the traditional leaders.

**Table 1.** Relevant authorities for conflict management

<b>Authority</b>	<b>Domestic (%)</b>	<b>Livestock (%)</b>	<b>Irrigation (%)</b>
Only traditional leaders	66	92	95
Traditional leaders and community	21	0	4
WATSAN	13	8	1

As a means of conflict resolution, the traditional leaders together with the community members have developed their own adaptive strategies used in conflict management. The potential sources of conflicts and the strategies employed in the resolution of these conflicts are given in the next sub-section.

##### 4.2.1. Water allocation

Water allocation as a principle is used to avert conflicts among farmers who rely on dugouts all year round for their agriculture activities. The use of water in the dugout for dry season farming was apportioned based on time. With this principle, individual farmers were entitled to water for specified hours during the day after which the opportunity reverted to other farmers for the same amount of time. However, from key informants it was revealed that there existed differences between farmers close to the dugouts and those farther away over the time schedule for the release and use of water. The latter complained of not having access to water

after those closer to the dugouts have exhausted their time of water use. This came about as a result of the low water levels in the dugouts during the dry season. This issue was resolved through the rescheduling of the time of water use. Allocation of water by time according to Ampomah (2008) has been practiced successfully in Binduri, a community in the Volta Basin. This method of water allocation according to other studies (Ampomah, 2008; Wolf, 2000) helps spread the risk of fluctuating supply as broadly as possible and by so doing preventing conflicts.

#### *4.2.2. Negotiation for land use*

From the study, land use was identified to be one of the potential causes of conflict. This particular type of conflict existed in areas with dugouts. Within these communities, rules were established so that owners of land close to the dugouts release those lands for reallocation to the whole farming community during the dry season. More often than not, the reallocation exercise generated conflicts between those whose lands are close to the dugouts and those far from the dugouts. From a key informant, there are times that farmers close to the dugouts are unwilling to give out their lands for redistribution. On the other hand, those with land far off are also eager for lands close to the dugouts. Instead of applying the rules which often exacerbated the conflict, the WUA now have adopted the negotiation approach. In this approach, owners of land close to the dugouts are made to understand the importance of collective action in improving their livelihoods. Interestingly, according to key informants, this approach has yielded more results than when the rules were strictly adhered to. This goes to proof a point made by Ampomah (2008) that the application of strict rules and regulations in conflict management may not always be effective.

#### *4.2.3. Water Access*

Another type of conflict identified was with regard to water access between crop farmers and herdsmen. This type of conflict runs across all the study communities. Since farms are close to dugouts and the Black Volta River, animals going for watering turn to destroy crops. This at many times generated conflict between the farmers and the herdsmen. By way of managing this type of conflict, designated watering points have been provided at both dugouts (Figure 2) and river for livestock watering. Punishment in the form of a fine is meted out to herdsmen who refuse to water their livestock at the designated points.

#### *4.2.4. Introduction of coping physical strategies*

In both Tanduori and Wechiau, coping mechanisms have been adopted to increase water storage in the dugouts during the rainy season. These communities carry out manual dredging of the dugouts in the dry season and by so doing increasing the volume of water stored in the rainy season. Another strategy that has been adopted by individual farmers in all the communities is the construction of wells (Figure 3) on individual farm plots. These wells are mainly dug at the onset of the rains with the aim of storing water. By this, the pressure on the main sources of water is greatly reduced because most of the farmers have access to water on their own farm plots. Interactions with community leaders have shown that, this particular type of strategy has helped in minimizing conflict associated with the reallocation of lands. Farmers far from the

dugouts are not so eager anymore to get closer to the dugouts. For that matter, owners of land close to the dugouts can still keep their farmlands without reallocation.



**Figure 2.** Designated watering point close to dugout



**Figure 3.** Well on farm plot

#### *4.2.5. Payment and accountability*

Another source of conflict found within the study area was the introduction of payment for domestic use of water from the boreholes. An amount ranging between 20 – 50 pesewas (US\$0.10 and US\$0.25) per month were paid per head for accessing water from the boreholes. The payment of these tariffs created tension,

since traditionally no tariffs were paid for accessing domestic water. The information gathered from respondents and key informants indicated that, the operation of the boreholes generated conflicts due to the preferential treatment given to certain water users and allegations of lack of accountability on the parts of the revenue collectors. An exception to the tariff payments was found in Wechiau. In this community, water from the boreholes were accessed free of charge. Unlike the other communities, where repair and maintenance of the boreholes were carried out using the tariffs collected, boreholes in Wechiau were maintained by the Hippo Sanctuary tourism centre.

In addressing these issues, a mix of traditional and statutory system has been agreed on. Any conflict that arises out of the use of the boreholes is first resolved by the WATSAN committee and if no amicable solution is reached between the parties involved, the case is then referred to the traditional authorities as the next step.

#### *4.2.6. Priority of water use*

An important principle that exists in all the communities is the priority of water use doctrine. In the event of scarcity of water resources, this principle provides for a means of allocating the resources between the different types of uses. The study found out that in terms of prioritizing water, water for domestic purposes comes first. This is because water for drinking, bathing and cooking are considered essential for human survival. The next in line in terms of priority of water use was for livestock watering followed by irrigation. This is an indication of how the study communities will preserve water for their livestock at the expense of cropping activities. The above trend of prioritizing water is the same as that identified by Wolf (2000) among the Berbers of Northern Africa. Among this group of people, highest priority is for drinking water for humans, followed by drinking water for animals both of which were considered sacrosanct and neither may be denied anyone for any reason at any time. The next priority was water for irrigation.

By prioritizing uses of water, risk can be distributed more equitably by allowing critical uses to have the highest priority in times of fluctuating supply. Wolf (2000) also illustrates this potential benefit of prioritizing water use among the Berbers and Bedouins of Northern Africa.

## **5. Main institutional actors**

The presence of institutional actors at the local level was paramount with considerable positive impact on sustainable natural resources management. One of such key institutions is embodied in the traditional system of governance at the local level. For all the five communities, reverence was given to traditional leaders. Top on the hierarchy of the traditional system of governance is the chief; followed by the Tindana (custodian of lands) and the Assemblyman. According to the community inhabitants, the chief is the owner of all water resources within the community with the Tindana being the owner of all lands. With respect to land use activities, the Tindana is always informed before any such activity is carried out. These practices regulated the use of water and land resources and by so doing ensuring their sustainability. A key lesson from this is that, since these authorities are highly revered, they can be used as a focal point to enhance



integrated water resources management at the community level. In this way, sustainability for both water and land resources will easily be achieved due to community involvement in natural resources conservation (Mohamed-Katerere, 2004). Highlighted in Table 2 are the fundamental roles and functions of the traditional leaders as far as water resources management are concerned. The research also revealed that these traditional leaders carry out their responsibilities to the latter without any remuneration. According to Mohamed-Katerere (2004), the best approach of ensuring sustainability of water governance is through stakeholder and community based resource management actions. This is clearly seen in the roles and responsibilities of the traditional leaders and hence could be said to be a good initiative towards sustainable management of water resources. Studies in other African countries (Nompumelelo, 2001) have shown that traditional practices are still in use and have proven to be efficient in the management of water resources. Local management according to van Koppen et al., (2004) is thus seen as the best option for the management of water resources at the local level.

**Table 2.** Fundamental roles and functions of traditional leaders in water management

Leadership Type	Roles and functions
<b>Chief</b>	<ul style="list-style-type: none"> <li>• Managing water conflicts and disputes.</li> <li>• Ensuring conservation and protection of water sources.</li> <li>• Ensuring availability of water in community.</li> </ul>
<b>Tindana</b>	<ul style="list-style-type: none"> <li>• Managing and controlling land resources.</li> <li>• Liaise with chief to settle disputes.</li> <li>• Ensures conservation of natural resources.</li> </ul>
<b>Assemblyman</b>	<ul style="list-style-type: none"> <li>• Liaise with district assembly to provide potable water.</li> <li>• Liaise with WATSAN members to ensure routine maintenance of boreholes.</li> </ul>

## 6. Conclusions

The study has shown that though there exist potential conflicts in the use of the available water resources, these sources of conflict can be managed effectively through community based initiatives. These initiatives from the findings of the study more often than not achieve expected results of resolving the conflict at hand. Stakeholder participation though not a panacea was a necessary aspect that promoted the successful implementation of the community based initiatives. The ultimate aim of community based initiatives is to

address conflict issues by thinking of water governance based on community participation and equality of access to freshwater. As a lesson, the principles of negotiation and water allocation as practiced in the study area can be applied in international transboundary water courses.

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