



## 4 CLIMATE CHANGE ADAPTATION OF WATER-BASED ECOTOURISM: PERSPECTIVES OF MANAGEMENT OF THE PAGA CROCODILES POND IN NORTHERN GHANA

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### Abstract

Ghana boasts of several ecotourist sites such as the Paga crocodile ponds which are contributing to the development of local communities. However, ecotourism is climate sensitive thus any change in climate consequently affects it. It is, therefore, not surprising that climate change is affecting ecotourism. Noteworthy, in Ghana evidence abounds of an increase in temperature and a decrease in mean annual rainfall in all the country's ecological zones with this having an impact on ecotourism attractions. To promote ecotourism under this changing climate, management, operators, and local communities in the country have put some adaptation measures in place. Therefore, this article, assesses management perceptions of climate change manifestations, climate change impacts and the nature of institutional arrangements adopted to promote climate change adaptation at one of the Paga crocodiles' ponds. An exploratory design involving the use of in-depth interviews, observation and desk reviews was applied to generate primary and secondary data for the analyses. Members of the Community Tourism Committee and tour guides were contacted. The results revealed that climate change manifestations in the form of an increase in temperature and a decrease in temperature have significant impacts on the pond and tourist activities. Water levels in the dam decreased while water temperature increased forcing the crocodiles out of their habitats which sometimes resulted in their death. The pond has also been invaded by alien crocodile species that sometimes attack the local reptiles. To enable the pond to adapt to climate change impacts, management recombines informal practices and institutions with formal institutions resulting in what is called institutional bricolage.

**Keywords:** climate change, ecotourism, bricolage, institutions, Ghana

### INTRODUCTION

Ecotourism is gaining currency in the world and contributing enormously to the development of local communities and national economies. According to Ouma et al. (2014), water-based ecotourism, for instance, has received a lot of attention in the Caribbean Islands, the USA and the Middle East as it is contributing significantly to economic development and nature conservation. In Ghana, ecotourism contributes to revenue generation, community development and natural resources conservation (Eshun, 2011; Eshun & Tagoe-Darko 2015).

Noteworthy, however, ecotourism is climate dependent as Tanrisever, Pamukçu. and Baydeniz (2024) noted, that rising temperatures, changing precipitation patterns, and the increasing frequency

and severity of extreme weather events affect tourist sites and tourism supply and demand. According to Shaaban and Ramzy (2010, p. 243), "climate defines the length and quality of tourism seasons and plays a major role in destination choice and tourist spending. Climate affects a wide range of the environmental resources that are critical attractions for tourism, such as snow conditions, wildlife productivity and biodiversity, water levels and quality. Climate also has an important influence on environmental conditions that can deter tourists, including infectious disease, wildfires, insect or water-borne pests, and extreme events such as tropical cyclones". Marshall et al. (2011) thus, concluded that climate change affects the value and attraction of tourist destinations. According to Ijeomah and Aiyeloja (2009, p. 170), climate change



manifestations affect ecotourism. For instance, “drought affects ecotourism, disperses water birds which are core attractions for bird watchers; flooding destroys beach tourism, landslides adversely affect ecotourism, change in rainfall pattern has adverse effects on both mountaineering and cultural tourism. Intense heat and cold increase pest and disease outbreak, leads to death of animals, hinder germination, and cause crop failures which increases the cost of running tourism”

Analysis of future climate scenarios revealed that an increase in temperature will affect ecotourism that is ecosystem-dependent as there will be an invasion by alien species, over-exploitation, land use change, and habitat fragmentation among others (Devisscher, 2010). Citing the existing climate impacts on tourism in Brazil, Grimm et al. (2018) documented that climate change impacted tourism through the destruction of tourism infrastructure, reduction of periods of sun exposure and incidence of skin cancers.

This notwithstanding, it is noted that the management of tourist sites could play a significant role in navigating these places through any natural challenges such as climate impacts. As Barišić, and Marić (2012, p. 429) asserted “management of tourist organisations is about planning, leading, organising, controlling and managing resources. That process is seen in all kinds of tourism organisations. How successful their organisations will be run depends on tourism managers”. Therefore, management understanding of climate change, its impacts and adaptation is seen as critical in sustaining tourist sites and for the continuous promotion of tourism in local communities. Also, since management makes decisions that recognise the existing institutions and practices, it is expected that adaptation will be achieved. As noted, institutions shape the impact of climate change on communities, shape the way

communities respond to climate change and serve as the intermediaries for external support to adaptation (Agrawal et al., 2008). Gupta et al. (2010) added institutions enable societies to respond to the damages or benefits of climate by guiding that society to choose the best adaptation option. Furthermore, Mubaya and Mafongoya (2017) noted that institutional arrangements which may be informal sometimes encourage collective actions as a way of supporting vulnerable communities to adapt.

Ghana boasts of several ecotourist sites that serve as the top destinations for tourists. Northern Ghana in particular has notable natural water-based tourist sites; the Wachieu Hippopotamus Sanctuary and the Paga Crocodiles’ Ponds. The Paga crocodiles’ Ponds (two are noted for ecotourism) are not only contributing to community development through revenue generation from tourism but also significantly meeting the spiritual, cultural and social needs of the people. Furthermore, students visit the pond to have more practical knowledge and information on the history and culture of the people. Meanwhile, the Ministry of Environment, Science, Technology and Innovation (2013) indicated in the Ghana National Climate Change Policy that climate change and its impacts are already evident in the form of an increase in temperature and a decrease in mean annual rainfall in all the country’s ecological zones. The average rate of increase in temperature has been 0.21°C per decade, with a more rapid increase in the northern regions of the country. On the part of rainfall, the policy states that rainfall in the country has decreased from the south to north over the past 40 years with rainfall patterns becoming more erratic in all the ecological zones in Ghana. Furthermore, the Ministry of Environment, Science, Technology and Innovation (2015) using historical rainfall data, to predict future scenarios of climate change revealed that rainfall across the



country will decrease by 2.9% by 2040, with a slight increase of 1.1% in the mid future (2060) and later decrease in the far future (2080) by 1.7%. Throughout the country projected mean temperatures will increase in the near future by 3.8% by 2040, 5.6% by 2060 and further increase by 6.9%. Already, climate change manifestations are evident as “the three northern regions of Ghana have experienced extreme climate change pressures such as droughts, floods and heavy storms” (Alhassan and Hadwen, 2017, p. 2). In 2006 the northern part of the country experienced drought while in 2007 and 2010 there were floods (Martin, 2006). This significantly affected both human and animal lives. Regarding water resource availability in the country, Kankam-Yeboah et al. (2009) noted that the country is likely to experience water stress by 2025 even without the impacts of climate change even though climate change will exacerbate the situation. Since the ponds are mostly naturally recharged, this implies that the water supply in them will be consequently affected.

Noteworthy, a corpus of literature exists in Ghana that focuses on the socioeconomic contributions of tourism to local development (see Kwoyiga and Apusigah 2017) but little has been documented on climate change impacts on ecotourism, especially from the perspective of management in the country. One of the Paga crocodiles’ ponds which is the focus of this study was one of the cases studied by Yahaya et al. (2022), however, the study only examined the economic and environmental impacts of ecotourism, ignoring the impacts of climate change and adaptive measures of each study area. Furthermore, existing studies in the country about ecotourism and climate change adaptation (such as Abdul-Kadri et al. 2022; Ofori et al., 2021) largely ignored the place of institutions and water resources. Though Shaibu et al. (2018) studied climate change and institutions in northern Ghana, the focus was on farming. Kwoyiga (2019)

studied climate change and institutional roles, but the study explored groundwater resources for dry-season farming. Though Agyeman’s (2019) study focused on climate change adaptation in protected areas in Ghana, it rather identified ecotourism as an adaptation strategy.

Therefore, to contribute to the existing literature about climate change and ecotourism in the country, this article aims to assess management perceptions of climate change manifestations, climate change impacts and the nature of institutional arrangements adopted to promote climate change adaptation of one of the Paga Crocodiles Ponds commonly called the *Chief’s Pond*.

This research is significant because it provides insights into how ecotourism can be sustained under climate change impacts in Ghana. For instance, the results of the analyses of local management perceptions of climate manifestations contribute to creating local knowledge and awareness of climate change occurrences. The analysis sheds light on the myriad of challenges and costs that are associated with domestic tourism promotion in the face of climate change. The analysis of adaptation measures provides local climate data for the Ghanaian tourist industry in general. The study illuminates the often overlooked but significant contributions of community-level institutions, traditions and practices in addressing climate impacts. Methodologically, it contributes to advancing knowledge on the important application of institutional bricolage of Critical Institutionalism particularly to water resources issues in Africa (Mayaux, et al. 2023; Nunes & Fielmua, 2021).

## LITERATURE REVIEW

### Ecotourism Development in Ghana

Ecotourism in Ghana, according to Eshun (2011) can be categorised into three levels: state-led



ecotourism; community-based ecotourism; and privately owned ecotourism. He explained that while state-led ecotourism initiatives focus on protected areas in the country and are managed solely by the Wildlife Division, community-based ecotourism that draws from local community natural resources is completely controlled by local communities. On the other hand, Zeppel (2006) categorized ecotourism activities in Ghana into three (3) geographic circuits. The first is the Savannah Circuit comprising the Wechiau Hippo Sanctuary, Paga Crocodile Pond, Nania Slave Camp, Widnaba Slave Camp, Tongo Hills, Tengzug Shrines and Sirigu Pottery and Art. The second is the Volta Circuit which is made up of Amedzofe, Tagbo Falls, Tafi-Atome Monkey Sanctuary and Xavi Bird Watching. The third is the Forest Circuit encompassing Bunso, Arboretum, Bobiri, Boabeng Fiema and Tano. Recent community-based ecotourism sites such as the monkey sanctuary at Kokrobite and the Amanzuri wetlands at Nzulezu have also been mapped out. Zeppel (2006) further noted that the industry since the mid-1990s has been receiving support from the Ghana Tourism Authority, local Non-Governmental Organisations (NGOs), the Nature Conservation Research Centre and the Ghana Wildlife Society with the aim of improving income levels of rural communities and conserving the few local ecosystems remaining.

More so, the Ministry of Tourism and Diasporan Relations (2012) came up with some principles which guide the activities of government ministries, departments and agencies with the aim of promoting and enhancing tourism development in the country. These include: diversification and expansion of the sector to increase revenue generation; promotion of domestic tourism as a way of fostering national cohesion and redistributing income; preservation of historical, cultural and natural heritage through sustainable and responsible

tourism; and deepening existing tourism institutions with policy formulation, planning, monitoring and evaluation at all levels.

### **Theoretical Framework**

The theoretical underpinning of this paper is the concept of Institutional Bricolage, nested within a wider body of critical institutionalism. Institutions connote different things to different people depending on the researcher's background or school of thought. While Ostrom (2010) explained that institutions are the rules, norms and strategies which guide the activities and behaviour of individuals in an organization, Helmke and Levitsky (2004) stated that they are the rules and procedures (both formal and informal) that structure social interaction by constraining and enabling actors' behaviour. Considering their nature, institutions are seen to be "both formal and informal; they are often multi-purposed, intermittent and semi-opaque in operation. These include designed arrangements of varying degrees of publicness and formality, institutionalized interactions as embodied in kinship and social networks, relations to reciprocity and patronage and in sets of norms and practices deeply embedded in the habits and routines of everyday life" (Cleaver, 2017, p. 13-14).

Regarding the concept of Institutional Bricolage de Koning and Cleaver (2012) explained that it represents the conscious and unconscious piecing together of different institutions, styles of thinking and social relationships by various actors to produce new responses to changing circumstances, in this case, climate change. It critiques formal institutions (as espoused by Elinor Ostrom of Mainstream Institutionalism) that can be crafted deliberately for a particular purpose. Therefore, "rather than seeing people as rational and essentially economic-resource appropriators, we can reconceptualise them as conscious and unconscious social agents, deeply embedded in their cultural



milieu but capable of analysing and acting upon the circumstances that confront them and recognize social relations as important in shaping behaviour in the use of environmental resources (Clever, 2001, p.29). It thus argues that local communities guided by their local knowledge of resources, environmental conditions, local practices and cooperation can facilitate good resource management (de Koning and Clever, 2012).

Regarding the formation of institutions through bricolage, Cleaver, (2012) identified five key characteristics: (i) everyday practice (ii) multi-purpose institutions (iii) naturalization, leakage of meaning, the invention of tradition (iv) conscious and non-conscious action, moral rationalities and (v) authoritative processes and unequal outcomes. To determine how local actors practice institutions formed out of bricolage, de Koning (2011) presented that such is done through (i) aggregation that is when culture, and routines. Traditions, social norms, needs and experiences are recombined with formal institutions (regulations and standards) and imposed on the community with this recombination both types of institutions correspond or are in harmony.

The second form of practice of institutional bricolage is alteration which refers to modification of both imposed institutions and locally embedded institutions such as cultural beliefs or social norms. It involves the adaption of well-worn practices to new circumstances. Articulation is the last practice which denotes the situation where formal institutions are in conflict with local identities thus resulting in their rejection by the local actors. The local people may distance themselves from or revolt against such.

The application of this concept will thus first of all help unpack the evolution and nature of the pre-existing institutional arrangement that the management and the Paga community apply in regulating tourism activities of the pond. Secondly,

the concept is about the “adaptive processes by which people incorporate configurations of rules, traditions, norms and relations of meaning and authority. In doing so, people modify old arrangements and invent new ones, where innovations are always linked to freedom to create acceptable ways of doing things” (Clever 2012, p. 34). Viewing the study through an institutional lens will allow for the analysis of how norms evolve with time and get adopted for adaptation (Gebara, 2019). The concept will also help analyse the key elements of the current institutions and how these are being practised or applied for adaptation to climate impacts.

## MATERIALS AND METHODS

Geographically, Paga is located in the Upper East Region of Ghana. It is a border town between Ghana and Burkina Faso in the northeastern part of the country. Paga is also the administrative capital of the Kassena/Nankana West District Assembly. It is a home to the Kassena people. According to the Ghana Statistical Service (2014), the climate of the entire district including Paga is characterized by two seasons which are influenced by two air masses. The first season takes the form of a warm, dusty and dry Harmattan air mass which blows in the north easterly direction across the whole district from the Sahara Desert (commonly called the North East Trade Winds). These winds usually blow from November to March. At this time, there is no rainfall, vapour pressure is very low (less than 10mb) with relative humidity at about 20.0% during the day. Temperatures during the day are recorded up to 42 degrees Celsius (especially from February to March) and as low as 18 degrees Celsius in the night. The second season is the rainy season which runs from May to October. At this time, the area comes under the influence of the Tropical Maritime air mass (South-Westerlies). The total



rainfall average is about 950mm per annum. The vegetation cover is Savannah grassland, with short drought-resistant and deciduous trees. One only finds dense vegetation along river basins.

In Paga, there are two community-based ecotourism sites namely the *Zenga Crocodile Pond* and the *Chief's Pond* locally called *Pe Dambuga* (located close to the Ghana/Burkina Faso border). Both ponds are about 5 kilometres apart and are easy to access due to their strategic locations. The *Zenga Pond* is located behind the Paga market while the *Chief's Pond* is located a few meters away from the main road which connects Ghana with Burkina Faso at the Border. For this study, the *Chief's Pond* is chosen.

The choice of this pond is based on its unique characteristics and tourist activities, which make it incredibly interesting. For instance, it is believed that the chief/leader of all the crocodiles in Paga is found in this pond and it is recognised by a red head. Generally, the Paga Crocodiles' ponds are historic and traditional in nature. The ponds are mainly recharged by rainfall. Also, they have not been desilted or drenched before even though the population of the mammals is believed to be increasing. The ponds are located in the northern part of the country, a zone that is considered the most vulnerable to climate impacts. All these have implications for tourism sustainability in the country.

The mystery behind these ponds is traced to the founder of the place called 'Nave' who it is believed, was a hunter. Feeling thirsty while hunting, he searched for water but his search yielded no positive results until he came across a crocodile which then directed him to the source of water. The crocodile, as widely held by the people followed the legend home and lived with him in the community. Appreciative of what the crocodile did for him, *Nave* decreed to his descendants that none of them should

eat the crocodile's meat. This crocodile and its offspring which are believed to be in the present-day ponds in the town, have since been revered by the people. These animals are tamed, and friendly and interact with all manner of persons who visit the ponds. With the help of the tour guides and a fowl in hand, a whistle is blown and the crocodiles come out of the water. Tourists can then touch them or watch them. The animals up to date live in their original natural ponds.

Regarding the *Chief's Pond* which is the focus of this study, its general activities are being handled by its management. The management comprises largely of people who are from the nearby local communities where the pond is located. The management takes the form of; (i) Community Tourism Committee made up of a Chairperson, Secretary and Treasurer, the Assembly Member of the Electoral Area and some elders. This Committee monitors the activities of the pond, conducts meetings with the local people and informs them about the benefits accrued from the tourist activities. It handles all formal issues pertinent to the tourist and tourist-related agencies in the community supervises the tour guides and recommends them for capacity-building programmes. (ii) tour guides who handle the day-to-day activities of all tourists are part of the management. (iii) The spiritual leader or Earth priest commonly called *Tiga-tu* who makes sacrifices and serves as the leader between the people and the gods of the land an important member of the management of the pond. (iv) The *Paga Pe* (Paramount Chief of Paga) who is the traditional political leader of Paga also plays a key role in the management of these sites. He is updated weekly about the activities at these sites. When it comes to daily visits by tourists, the tour guides are in charge.

The study was conducted based on fieldwork undertaken by the writer from January to May 2022, a period that is suitable for tourist



activities at the sites. The study employed an exploratory approach as a way of obtaining detailed firsthand information about the study topic. To generate primary data for the analysis, the study used in-depth interviews. These interviews were conducted with the members of the Community Tourism Committee and tour guides. Ten (10) people from the Community Tourism Committee (5 elders, the Assembly Member, and the 4 executives) were individually interviewed at their homes. Two (2) tour guides were also individually interviewed at the sites of the pond.

Thus, a total of 12 informants participated in the study. These informants were purposively sampled considering the focus of the study. The interviews were semi-structured with the questions being open-ended. Each interview session lasted about 30 minutes. Apart from the in-depth interviews, the researcher used other communication tools such as conversations and informal discussions to interact with and learn from the knowledge holders mentioned above to promote a better understanding of the topic. The interviews and other informal discussions were conducted in the local language (*Kasem*). Apart from the study applying the UDS Research Ethics Policy, it also ensured that the purpose of the study was explained to informants and sought their voluntary participation which they consented to.

The interviews were recorded with the permission of the informants. To augment the primary data, desk reviews of secondary data were undertaken. Also, records from the tourists were reviewed to provide a better understanding and information on the nature of tourists and tourist activities that visit the place. Visits to the crocodile pond allowed for observations of the physical nature of the pond, and tourist interactions and also contributed to first-hand information for the paper.

The data were analysed and presented in themes espoused by Braun and Clarke (2006).

## RESULTS

### Climate Change Manifestations and Impacts

#### *Rainfall Impacts, Consequences and Challenges*

From the responses of the informants, it is realised that rainfall in the communities has changed. That is, rainfall currently, is highly unpredictable and associated with extreme events such as droughts and floods in recent times. The responses further revealed that the rainy season has become protracted as rainfall is now experienced from June to October instead of from April to October as it was in the past. The informants recalled that 2006 and 2007 were years of severe drought and floods respectively with these years having a significant impact on ecotourism.

Regarding how these climate change manifestations affect the pond, crocodiles and tourist activities, a tour guide said this.

When floods occur, and considering the shallow nature of the pond, the living conditions especially the habitats of the reptiles are affected. This forces the crocodiles to move to drier places beyond the banks. As a pond located in an urban setting, this exposes the crocodiles to danger, especially of being attacked and killed at night by passers-by and moving vehicles. Also, in their search for drier grounds during floods, some of the crocodiles stray into people's homes and being scared by the presence of these mammals, some people sometimes become hostile towards them.

In addition, the flooded surroundings of the pond affect tourist activities. For instance, physical accessibility to the pond becomes difficult while



tour guides find it difficult to get the crocodiles out of the water for visitors to interact with. This negatively affects revenue generation. Floods also affect roads connecting these sites and tourist infrastructure. Visitors' sheds, usually made of local materials get submerged when the pond gets flooded. Some of these sheds collapsed completely rendering visitors without places to rest before or after the tour. Walkways that facilitate the movement of visitors closer to the pond get submerged also.

Explaining how climate change has also influenced the duration of both the dry and rainy seasons thus posing some challenges for tourist activities of the pond, the president of the Community Tourism Committee explained that:

While the rainy season is seen in recent times to be short, the dry season is perceived to be prolonged and considering the fact that, the pond is recharged by rainwater, a prolonged dry season often affects the availability of water in them. The water level in the pond in such a season usually decreases drastically almost to the point of the pond drying up. The size of the pond thus, shrinks further due to the decrease in water. This does not only affect the living conditions of the crocodiles but also the availability of food for them. For instance, since crocodiles crave moist conditions, they tend to scramble for moist habitats.

Also, weeds, fish and toads that serve as feed for these reptiles become less available. These situations cause the mammals to scramble for habitats and food. Narrating the consequences of this a tour guide said this:

When the crocodiles scramble for food, some crocodiles end up being injured in the

process, and others especially hatchlings even get killed.

Noteworthy also, in the midst of all these impacts of climate change, other activities such as fishing also go on in the pond. The people also draw water from the pond for building and construction activities in the community. These activities contribute to increasing pressure on the pond.

#### *Temperature Impacts, Consequences and Challenges*

Generally, temperatures in the northern part of Ghana are high, particularly in the dry season. Climate change has exacerbated this situation. From the interviews, informants perceived that high temperatures that used to be recorded in March are now recorded as early as January. Regarding how high temperatures impact tourism, an elder who is a member of the Community Tourism Committee said this:

Higher temperatures obviously heat the water in the pond to the level that the crocodiles find it difficult to stay in their natural habitats. This is compounded by the absence of vegetation cover near the pond to provide shade or serve as a shield to prevent the water from directly being hit by sun rays. This explains why during the peak of the dry season, the crocodiles find it difficult to stay in the water, particularly during the day. Some are, therefore, compelled to wander during the day in search of much better and cooler areas. As a result, some stray into abandoned wells (previously used for farming purposes) and other water bodies. This leads to the death of the mammals.

Associated with the higher temperatures is a higher rate of evaporation of the water in the pond





which influences the availability of water in the pond. The water level consequently reduces faster and this causes the size of the pond to shrink. Eventually, the habitats of these animals are affected and this again pushes some of the animals to migrate in search of other water bodies as their number far exceeds the size of the pond and the water available. The limited water available in the pond, coupled with extremely high temperatures in the dry season results in the migration of these animals to other places. Not only do these animals fail to return to the pond, but some end up being killed by moving vehicles or by human beings. This affects the population of the animals in the pond which also affects the quality of tourist activities.

#### **Institutions and the Crocodiles' Pond as a Tourist Site Under Climate Change Impacts**

##### *Knowledge, Practices and Institutional Arrangements of the Pond*

The study revealed that the activities of the pond continue to be carried out largely through the application of local knowledge and informal institutions (taboos and rules). The local knowledge regarding the pond emanates from the people's tradition and culture, beliefs, rituals and sacrifices, and the spiritual consultations between the gods in the pond and the people through the soothsayer. The people of Paga strongly believe that the crocodiles are their totems and each crocodile represents the soul of an individual in the community. Their spiritual importance is thus, paramount as this has led to the creation of beliefs around these crocodiles. Regarding how local knowledge helps in understanding and interpreting events that involve the crocodiles and the pond, an elder said this:

When we hear the cry of a crocodile at night, it means an old man is about to die in the community.

Another elder explained that taboos are being used to help manage the pond and control the behaviour of the people towards the pond and the crocodiles. He said:

It is a taboo to visit the dams at night unless there is an attack on the crocodiles as the people believe that a loud cry of the animals in the night means a stranger has come to harm them. Furthermore, it is forbidden for people to unnecessarily visit the pond at night as it is believed that the gods in the pond only come out in the night to rest and no person is supposed to meet these gods. These crocodiles usually lay their eggs in the refuse dumps of the local people, it is therefore forbidden for people to harm them when the animals are found in their homes. People should not also threaten the lives of these crocodiles when they are seen roaming. Also, when a crocodile is lying down outside the water with its eyes closed, it is forbidden to walk in front of it. The people are also forbidden from eating the meat of crocodiles.

Regarding communication with these mammals in the spiritual realm, the most important way is through the soothsayer and this has been the practice as explained already. When there is the need for sacrifices and rituals to be performed, the *Tiga tu* (earth priest) officiates the process and that is after consultations have been made with the soothsayer. When tourists want to interact with the crocodiles, they get closer to them by approaching them from their backs and not their heads. Tourists are only allowed to sit on or touch the tail of the crocodiles.

While appreciating the role of people's local knowledge, institutions and management in contributing to the protection of ponds, some challenges exist. For instance, strangers and



poachers sometimes attack the animals, especially at night. Also, people with different belief systems sometimes break some taboos, traditions and practices while scientific knowledge together with technology makes some people to also question some of the beliefs. Urbanisation and environmental degradation are also threatening the pond and its tourist prowess.

Notably, in recent times, climate change and its impacts are exacerbating the challenges that these ponds face. It is against this background that management of the pond saw the need to innovate, improvise and consciously and unconsciously adopt some strategies and measures to promote adaptation and ecotourism sustainability. This has culminated in a new form of institutions; from the recombination of the pre-existing ones with formal institutions, thus creating a situation that depicts the concept of institutional bricolage as explored further by the study.

#### *Institutional Bricolage and Climate Change Adaptation*

Institutional bricolage is seen to be taking place as part of management efforts to promote the sustainability of the pond and its tourist activities. From the interviews, institutional bricolage is seen in the composition of the management of the pond which includes a Community Tourist Committee (depicting a formal structure even though with a community outlook). These changes reflect the measures of the central government to promote tourism in the country. To protect and promote vegetation cover, by-laws to augment the existing taboos, norms and practices have been passed by the chief of Paga, Paga Pe Charles Awiah Awampagah. These by-laws forbid not only the indiscriminate cutting down of trees near these water ponds but in the Paga area. The Chairperson of the Community Tourism Committee said this.

One can see that the by-laws made by our Paramount Chief are similar to those formulated by the country's Environmental Protection Agency regulations and Ghana Tourism Regulations aim at fighting desertification and degradation and preserving and protecting tourists' sites respectively in the country. I think having such bylaws formulated by our local leaders will help protect our natural resources.

Furthermore, historically, the pond was open in nature but fencing of the pond has become a necessary local strategy adopted by the people even though there still exist some security challenges. A tour guide said this:

The pond because of its location (close to the Ghana Burkina Faso highway) has now been fenced with modern wires. Initially, this pond was open. We managed to get some materials to fence it but such did not last until we decided to buy better materials that are more secure and sustainable.

Capacity-building programmes for tour guides are another way by which the management is boosting tourism and promoting adaptation. While recognising the community-chosen tour guides, as part of measures to boost tourism in the face of climate change, the Ghana Tourism Authority representing the Ministry of Tourism periodically organises capacity-building programmes for these tour guides as a way of equipping them with up-to-date skills and knowledge, especially in handling foreign visitors. This again provides evidence of institutional bricolage where formal tourist agencies collaborate with local tourist management to promote ecotourism adaptation to climate impacts.

Record keeping has become a necessary information tool to help promote adaptation and boost ecotourism. Though initially, the management



of the pond had a way of keeping records about the tourist activities that go on at the sites, this was informal and limited to the Paga Community (information not shared with other persons/agencies). As part of measures to adapt in recent times and the Community Tourist Committee now having a formal leadership structure, record keeping has become imperative. This has been boosted by the Ministry of Tourism which has been providing training to the management on better record keeping. The importance of proper record keeping is to monitor the performance and progress of the pond. It is also to identify the pressing needs, threats and challenges that the pond faces. The Regional Tourist Board periodically reviews these records to ensure their compliance with national tourism regulations.

A tour guide said this:

Madam, these are books that document information about the visitors and the charges that they pay. We have been trained on how to enter such information in

these books. The books are checked and audited regularly.

The responses further revealed that the management of the pond has agreed to make the pond part of Ghana's designed programmes to promote tourism by the Ministry of Tourism. For instance, the pond has been classified under the Northern Circuit as a way of formally regulating and supporting them as noted already in the literature. Through the Ghana Tourist Board, the pond receives support such as promotion and marketing locally and globally of the pond through the production of promotional materials and conducting research in all the country's tourist sites including the pond, facilitating the development of the site and human resource development. For instance, at the arrival hall of Kotoka International Airport in Ghana, is a giant billboard with a picture of one of these crocodiles outside the pond with a tourist guard squatting beside it. Several tourists outside Ghana have toured the pond already (Figures 1)



Figure 1: A tourist with one of the crocodiles

Source: Fieldwork, 2022

The management of the pond has further adopted and applied formal tourist regulations of Ghana. Recognised formally as a tourist site in the

country, the pond regularly pays the Tourism Levy of 1% and the pond in turn enjoys financial support where necessary from the Tourism Development



Fund. The Tourism Development Fund was established by the Tourism Act 2011 (ACT 817) to provide funding for tourism and tourism-related projects and programmes. (Section 21). According to Tourism Act 2011, ACT 817, Section 22, the Board shall apply the Fund to relevant tourism activities particularly;(a) marketing and promotion of tourism; (b) capacity building, market research and development of tourism infrastructure; (c) development and promotion of other entrepreneurial activities; (d) tourism export trade-oriented activities of institutions; and (e) tourism education and training.

Situating the responses above within the context of Institutional Bricolage, one sees the key elements of the concept (Cleaver, 2011) manifesting. The results showed that the current institutions by nature depict a recombination of both informal traditions, practices, norms and taboos and formal regulations, agencies and rules. For instance, the element of multi-purpose is seen in the community bylaws (drawn from Ghana's Environmental Protection Agency regulations) made by the Chief of Paga which are meant not only to protect and conserve trees near the pond but applied to the entire Paga enclave. Regarding the naturalisation/invention of traditional elements, this is typified by the locally appointed tour guides who in order to be updated with tourist handling skills have been formally trained by the Ghana Tourist Board Authority. In terms of their conscious and non-conscious action and moral rationalities, the responses showed the discontinuation of fishing, swimming and fetching of water for construction purposes in the dry season as a way of retaining more water in the pond.

With respect to the practice of institutional bricolage, the study context depicts aggregation and alteration. For instance, regarding aggregation, a formal way of documentation and record keeping

capturing tourist visits and revenue generated has been practised. In terms of alteration, the study revealed the innovation and improvisation made by the management to protect the lives of the animals in the pond. Traditionally, the ponds are supposed to be open, and unfenced but considering the myriad of climate impacts and human-related threats, they have been fenced. Alteration is also seen within the context of the Tour Guides who though locally appointed are being trained by the Ghana Tourist Board. Articulation represents the desilting of the pond with modern technology and equipment. This, the people are unwilling to accept as they rather prefer drilling boreholes nearby whose water would be channelled to the pond. The study findings thus support the broader contention that at least in the case of adaption, different types of existing institutions can be crafted (not necessarily deliberately creating new institutions) to regulate any environmental change.

## DISCUSSION

The study revealed the occurrence of climate change and its manifestations in the form of an increase in temperature and a decrease in rainfall. These manifestations are having a significant impact on tourist activities at the site as hot temperatures sometimes restrict the animals to the pond. Also, the search for moist conditions which sometimes result in the death of the animals reduces their population. These results are consistent with Shaaban and Ramzy's (2010) study which documented the negative impact of climate change on tourism in Egypt and Martin et al. (2017) study of climate and tourism in Catalonia. Similar to studies elsewhere (Grimm, Alcântara & Sampaio, 2018). this study further highlighted that climate manifestations consequently affect ecotourism in the form of destruction of tourism infrastructure, destruction of habitats, invasion of crocodile habitats by alien



species, loss of food for crocodiles, shrinkage of habitats and loss of crocodile species through attacks by alien crocodile species and human beings. The results further resonate and confirm the projected scenarios of climate impacts by Devissner (2010) of how climate impacts can contribute to habitat fragmentation and their invasion by alien species.

However, the study of Martin et al. (2017) contradicts this result as their study indicated that although tourist operators in Catalonia though are conscious of climate impacts on the appeal of tourist sites, they are less concerned because they feel that all landscapes of whatever kind in Catalonia are potentially attractive to tourist. The Management of tourist activities at the Paga Crocodiles are not only concerned about the impacts of climate change on the pond and their tourist activities but also taking measures to ameliorate the impacts. A possible explanation for this action of the management of the Paga Crocodile Pond could be that unlike most tourist sites whose benefits are largely socio-economic, the Paga Crocodiles' Pond by its historic nature offers more value as they meet also the cultural and spiritual needs of the people which the management think supersedes the socio-economic benefits of the pond.

The study revealed a wide application of both formal and informal institutions as tools for climate change adaptation. The results are thus consistent with the findings of Kwoyiga (2019) and Mubaya and Mafongoya (2017). The study results further support the broader notion of Cleaver (2017) and de Koning and Cleaver (2012) that in places such as Africa, no single institution can be deliberately crafted (as noted by Ostrom and others of Mainstream Institutionalism) for a particular purpose but that institutions are multi-purpose and deeply rooted in habits and routines of everyday life.

Conscious of the inadequacies of the pre-existing informal institutions particularly for climate

adaptation, the study again brought to the fore that institutional modifications, innovation and improvisation could be a possible adaptation strategy as evident here. This largely highlighted the point that the recombination of both formal and informal institutions offers a better opportunity to manage natural resources to sustain ecotourism under climate change impacts. It further highlighted that rather than being considered weak as criticised of pre-existing/ local knowledge, practices and informal institutions, these are strong as they can accommodate, coexist or be altered to promote adaptation to the impacts of climate change as happening now. In fact, it shows that these community-level practices and arrangements usually constitute the foundation upon which other institutions rest upon and for adaptation.

Therefore, considering the current nature of the institutional arrangements, it can be said that such depict the concept of institutional bricolage espoused by Cleaver (2012), de Koning and Cleaver (2012) as evident in the diversity in these elements and practices of the concept. Therefore, in terms of practice, the new institutions promoting adaptation embody both alteration and aggregation.

## CONCLUSION

The study set out to assess the manifestations and impact of climate change on ecotourism and the adaptation measures adopted by the management of the Paga crocodiles' Pond. The study highlighted that climate change is manifesting in the form of a decline in rainfall and an increase in temperature. This implies that climate change occurrences are being observed and understood also by domestic tourist operators in Ghana hence the need to recognise their knowledge of climate change adaptation efforts in the country.

The study further brought to the fore the significant impact that climate change is having on



ecotourism as floods and droughts affect the physical conditions of the ponds making life unfavourable for the crocodiles sometimes. It forms an important example of the increasing negative impacts of climate change on tourism in general and on ecotourism in particular, especially that which hinges on natural (water) resources and their ecosystems in Ghana. It is therefore important to consider designing measures that are geared towards creating resilience of natural resources that drive ecotourism in the country.

Furthermore, the activities of the pond which are mostly driven by the application of local knowledge and informal institutions are facing some environmental challenges such as the impacts of climate change. Therefore, to promote adaptation, it became necessary for the modification, reconstitution or alteration of the pre-existing institutions and practices. This, management has done hence resulting in a situation where the current institutions being applied could be described as intuitional bricolage. The study therefore reinforces the notion that for community-based ecotourism to adapt to climate impacts, existing institutions can be pieced together through innovation, improvisation, everyday practice and routines as evident in Paga.

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