# Can adaptation and mitigation synergistically cooperate? Lessons from Wa West District, Ghana

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## Abstract

This paper explores the possibility of synergising mitigation and adaptation strategies at the local level since both seek to arrest the menace of climate change. Based on a systematic analysis of data collected from four rural communities in the Wa West district, we expose the weakness in the solitary strategy adopted by local farmers to expand their socio-economic activities within fragile eco-systems. We argue that to build a sustainable 'immune system' for climate-induced vulnerabilities, local farmers need to balance their adaptation and mitigation strategies by considering and searching for mutually supportive actions and trade-offs. We opine that community resilience does not happen in a vacuum. Instead, community resilience is achieved through a collectively planned, transparent medium which empowers the community with knowledge about their risks, effectively equipped with the right skills to adapt, cope with, re-group and recover in times of disasters. This calls for investing in understanding and promoting specific local capacities to enhance community readiness and opportunities to unlock mutually beneficial approaches to climate change mitigation and adaptation.

**Keywords:** Mitigation; adaptation; vulnerabilities; Wa West district; Ghana

## Introduction

Arguably, the most defining socio-ecological issues of the 21st century are urbanisation and climate change. The latter, which is the emergence of the real and present threat to planetary sustainability and a potent force of climatic irreversible consequences, has attracted two major kinds of policy interventions: First, mitigation, which seeks to limit emissions of greenhouse gasses, or reduce the risk to life, property, socio-economic activities, and natural resources, has received unparalleled attention (OECD, 2008; While and Whitehead, 2013). The second, adaptation, which accepts some degree of change, seeks to limit the negative impacts of climate change (Ayers and Huq 2008; Zhao et al., 2018).

This paper conceptually sees both mitigation and adaptation as necessary for managing climate risks for two main reasons: First, that not even the most stringent mitigation

efforts can avoid entirely certain adverse effects of climate change due to the already produced emissions, thus making the action of adaptation inevitable (Kelly & Adger, 2000). Second, no society can engage in adaptation indefinitely; therefore, some mitigation measures are always needed to avoid the worst consequences (Willbanks et al. 2007a; King 2004).

In Ghana, the threat of climate change to development has been well documented (Armah et al., 2011; EPA, 2011; MESTI, 2013). Generally, the northern regions in particular face various climatic uncertainties, including increasing frequency, intensity, and duration of extreme weather events with dire consequences (Equavoen, 2012; Laux et al., 2008). The Future Agricultures (2012: 1) see local farmers in the region as: "… resourceful, innovative and entrepreneurial by necessity. While there are profound difficulties in creating secure livelihoods for all, there are also significant successes". The climate challenge is evoking diverse responses to ensure a sustainable biosphere for all forms of life.

The evidence bears policy implications. It quantifies how much the climate change menace –drought, flooding— increases rural poverty and compels the marginalised to resort to varied policy responses (Kansanga et al., 2021). It shows that not all locally adopted strategies may necessarily strengthen the local economy in the long run. This raises legitimate questions: Can locally crafted mitigation and adaptation measures conflict with one another? How can these strategies be co-managed? Can they cooperate and synergise with one another? Our paper engages in a broad inquiry on these questions. We reckon that climate change discourse involves varied actors who have generally found little reason to interact despite their common purpose (Luni et al., 2012). Since rain-fed subsistence agriculture and livestock rearing are the main economic activities at the local level, we believe that considering mitigation and adaptation will help formulate people-centred strategies. Using Wa West district (an ecologically challenging environment) as a case study, we examine how farmers' responses to climate variability (mitigation and adaptation) demonstrate an integrated approach. We assess the 'internal policy coherence' and to what extent the positive and negative attributes in both mitigation and adaptation are taken into account at the local level.

Our paper is presented as follows: The next section presents the paper's theoretical underpinnings, followed by a discussion of the data collection and analytical tools and methods. The results section first examines the four communities' mitigation and adaptation strategies and then explores the possibility of drawing synergies/trade-offs regarding their current practices. The discussion and conclusion sections outline implications for potential integration and provide recommendations to enhance climate change policy integration and coherence at the local community level.

## Understanding the mitigation-adaptation strategies nexus

Since 1988, when the UN General Assembly assumed responsibility for the fight against climate change, mitigation and adaptation have been the two primary human response strategies (Ayers and Huq, 2007). According to Willbanks et al. (2007), mitigation involves actions that are pre-emptively undertaken to reduce the magnitude of human contribution to climate change, while adaptation seeks to adjust the built and social environment to minimise its adverse outcomes and harness its beneficial opportunities (Kansanga et al. 2021). Technically, the Intergovernmental Panel on Climate Change (IPCC) sees adaptation as "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities"; and mitigation as any "anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gasses" (IPCC, 2001)

Following this, climate change can be seen as a universal systemic issue that needs approaches to reduce global greenhouse gasses (GHG), including emissions trading schemes and carbon emissions capping to prevent the worst-case scenarios of global warming (Ravindranath 2007). Though the fourth IPCC report (2007) had suggested that the two must be treated as twin sisters and be placed on an equal footing, there appears to be some institutional bias towards mitigation. An unintended consequence of the duality relates to situations where policymakers and negotiators treat the two strategies as policy alternatives, or as aptly put by Dang et al., (2003) in opposition to one another. For example, in the early 2000s, the World Bank conservatively estimated between $10 billion and $40 billion was spent on climate-proofing investments in developing countries, against a meagre adaptation investment of only $100 million to $500 million per year (Antwi-Agyei, et al., 2012).

Such unhealthy 'rivalry' calls for policy 'integration', 'coherence' or 'mainstreaming' (Adelle and Russel 2013). Though engaging fully with the debates is beyond the scope of this paper, we nonetheless adopt Nilsson et al.'s (2012) conceptualisation of policy coherence as the integration of governance and policy-making processes, focusing on residents' options for response to climate change hazards. We examine how the local strategies are mutually supportive or offer synergic and systematic support towards the achievement of common objectives; and as rightly noted by den Hertog and Stroß (2013: 4), local responses must be implemented so that they:

a) *reduce negative interactions (trade-offs) and seek to exploit positive interactions supporting mutually beneficial practices (synergies) between climate change mitigation and adaptation. We refer to this as internal climate change policy coherence;* and,

> *b) reduce negative interactions (trade-offs) and seek to exploit positive interactions supporting mutually beneficial practices (synergies) between climate change (mitigation or adaptation) and non-climate objectives. We refer to this as external climate change policy coherence (ibid).*

This is not to suggest that one strategy takes precedence over the other (Lafferty and Hovden 2003). Indeed, internal climate policy coherence does not necessarily imply that the joint outcomes are always favourable (Moser 2012). So far, the two remain the primary human responses to the climate challenge, though recently, resilience is gaining currency. Resilience generally relates to the capacity to accommodate or adapt to external threats. From the IPCC lexicon, resilience is explained as:

> *The ability to absorb disturbances, be changed, and reorganise and still have the same identity (retain the same basic structure and ways of functioning). It includes the ability to learn from disturbance. As resilience declines, the magnitude of a shock from which it cannot recover gets smaller and smaller. Resilience shifts attention from purely growth and efficiency to needed recovery and flexibility* (IPCC, 2007: 65).

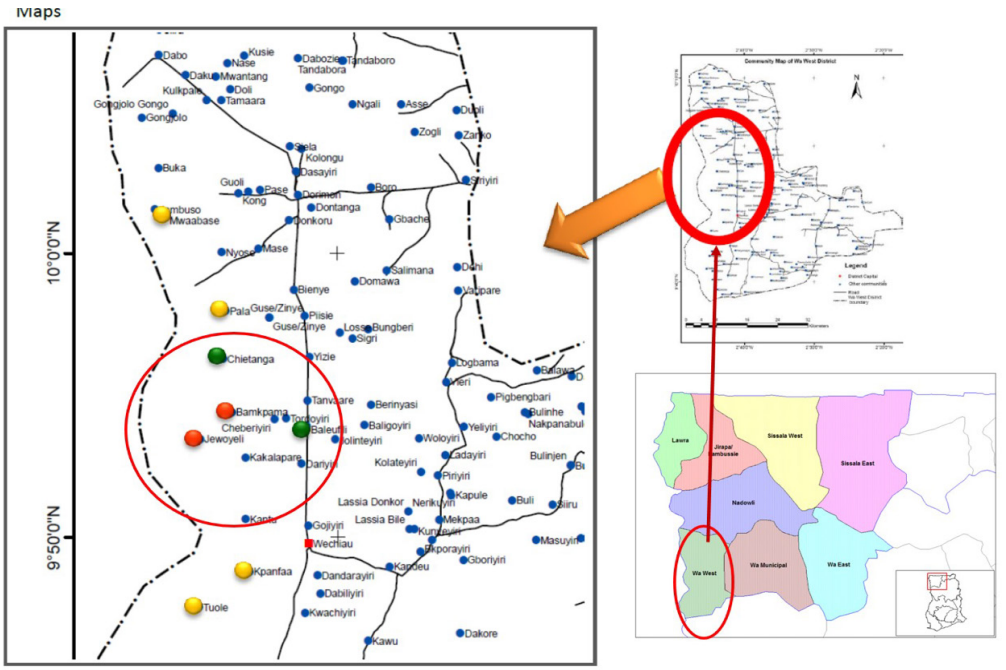
Our study argues that if building a resilient community is the overarching goal of local development, then adaptation and mitigation methods should achieve the intermediate objectives of reducing the biophysical, social and economic risk associated with climate change. Whether a balance is achieved between multiple objectives remains an empirical question discussed in subsequent sections. But before that, the following section presents the method used in the study.

## The study area and methodology

### The study area

This paper is culled from a larger national project titled "Enhancing Resilience to Climate and Ecosystem Changes in Semi-Arid Africa: An Integrated Approach", funded by the CECAR-Africa Project (see Samaddar et al., 2014; Samaddar et al. 2015; Kusakari et al., 2014). The data for this paper is complemented with a review of archival records and scholarly literature covering four research locations (Baleufili, Bankpama, Chietanga, and Zowayeli) in Wa West district, drained by the Black Volta river (see Figure 1). With a 2010 total population of 2,508, these communities face an imminent threat of increased flooding and drought situations (Samaddar et al. 2015, Kansanga et al. 2021). The communities' commonalities include identical mode of production, which is primarily rain-fed subsistence farming, with few irrigation facilities, a high occurrence of poverty, and the absence of both government and NGO support.

Figure 1: The map of Wa West District showing the four research localities.




**Source:** Samaddar et al.,2014

Economically, the communities' rain-fed agriculture absorbs about 96% of the working population and contributes about 80% to its economy (van der Geest, 2011:208). Only a limited number of farmers in Baleufili benefit from a community dam to engage in dry season gardening. Besides agriculture, some members participate in livestock rearing, poultry keeping, shea butter processing, pito (local beer) brewing, charcoal making, fishing, and petty trading (Antwi-Agyei et al., 2012).

Further, accessibility to markets remains a significant challenge, and farmers have to travel over 50 kilometres to access the only periodic market in the district capital every Thursday (Chidumayo and Gumbo, 2013). Above all, the level of education of majority (over 80%) residents does not promise access to any formal work. Hence, the prevalence of small-scale 'informal' enterprises (pito brewing, charcoal selling, etc.), described as *byela byela, nabra*, which means 'small things lead to big', offer promising development alternatives.

The community leaders recalled how the rusticity of the communities provided an alternative livelihood for survival during economic downturns. For example, while women intensified their search for shea nuts, the men resorted to fishing and hunting. Today, this optimism is being violated by the pervasive disjuncture orchestrated and perpetuated by climate change, making farming unattractive. Even where irrigation promises some respite, the cost of access to the irrigation facilities remains prohibitive.

Farmers today endure either floods that devastate large areas of their near-ready grain fields or several episodes of late rains during planting seasons (Van der Geest, 2011). Such is the plight of our sampled population, whose vulnerable conditions has inspired them and brought to the fore their innovative and entrepreneurial capabilities, which form the basis of our study.

## Research design and methods

For a detailed methodology of the larger project, see Samaddar et al. (2014; 2015) and Kusakari et al. (2014). We conducted a further three-month participant observation, 15 key informant interviews (KIIs) and 12 FGDs. Our team initially had a plenary meeting with the local stakeholders. A household survey was carried out in May 2013. Based on convenience and the researchers' experience, 40% of the total number of households per community was randomly selected from a geo-referenced database, totalling 92 (i.e. 35 households in Baleufili, 32 Bankpama, 15 in Chietanga, and 10 in Zowayeli).

Two adults of the opposite sex were interviewed in each household, using a guide and with the assistance of 5 local interpreters competent in the local languages (Waale, Dagaare, and Brifori). The FGDs were organised in August 2013 in all the communities. Our focus on participatory tools was informed by the desire to facilitate community participation, stimulate the exchange of ideas and generate empowerment and commitment.

The team further facilitated plenary discussions with officials of the Assembly and other public officials from the National Disaster Management Organization (NADMO), Ministry of Food and Agriculture (MoFA), Environment Protection Agency (EPA) and some Non-Governmental Organisations (NGOs) on climate and ecological change issues and disaster governance. The KIIs were transcribed and thematically analysed, pinpointing interviewees' concerns, opinions, experiences, and feelings. The survey was also analysed statistically, highlighting the trends among participants and between case studies. The local responses to climatic variability and their synergies or trade-offs are highlighted in the discussions below.

## Presentation of study results and discussions

This section presents two aspects of climate change architecture. First, we examine the perceived challenges of climate change from the perspectives of the farmers and key informants and how these are impacting their livelihoods and living standards. Second, we analyse the farmers' lived response strategies and their relationship. We chose this level of analysis for two main reasons. First, it presents each community's specific vulnerabilities and response options (as well as observed/unobserved characteristics); second, it ensures comparable units.

## The perceived climate-induced challenges

The results of the questionnaire survey showed that 88% of the households were male-headed, with an average household size of seven. Further, because most people are Christian, 42% live as nuclear families, thus coinciding with the findings by van der Geest (2011). Averagely, the educational level of household members older than 14 years was four years, while 77% had migration experiences. Further, 69% had acquired medium to large-sized land plots, with an average farmland holding of 8.2 ha.

We sought the respondents' perception of their observed climatic variability to conceptualise the links between climate change, their livelihood and coping strategies. We sought to uncover the nature of climate related-risks, their underlying factors, and the associated consequences on the farmers. Participants were made to rank (from 1 to 10) the commonly experienced challenges and how they affect their livelihoods, with the highest score being 10 and the least, 1. The overall results (i.e. 120) indicated that respondents perceived increasing drought as the most common, followed by storms (80 points). Detailed analysis showed that each community prioritised different vulnerabilities (see Table 1).

**Table: 1**. Community-based vulnerability rankings (frequency)

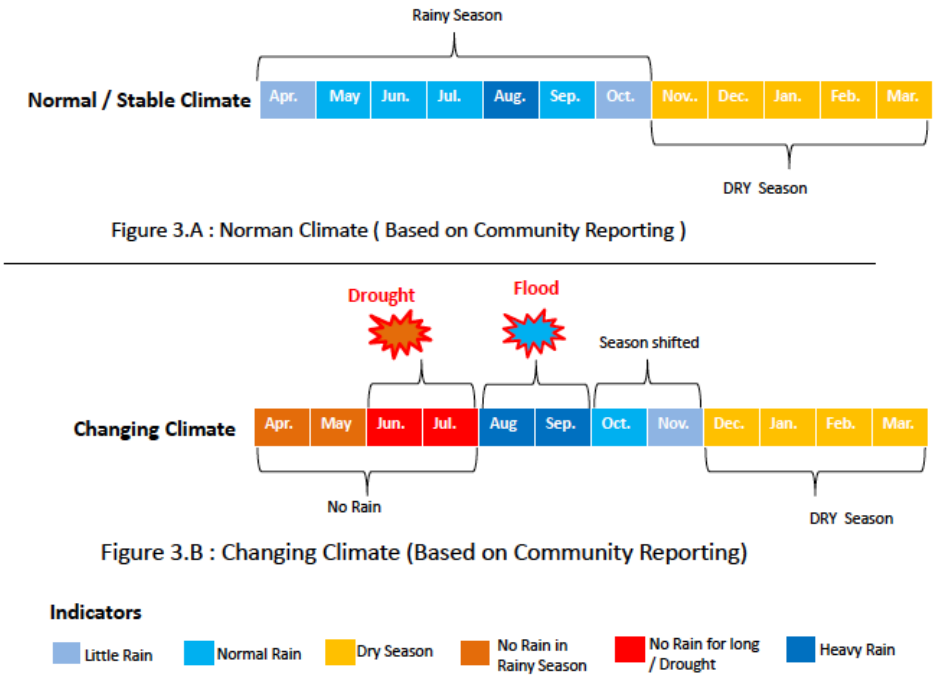
| | **Baleufili** | **Bankpama** | **Chietanga** | **Zowayeli** |
|---|---|---|---|---|
| 1. (Most common) | Drought (30) | Drought (30) | Drought (30) | Drought (30) |
| 2 | Bushfire (26) | Storms (18) | Storms (22) | Flood (19) |
| 3 | Storms (23) | Temperature (17) | Beginning of rain (19) | Storms (17) |
| 4 | Rainfall amount; 12) | Rainfall amount (16) | Temperature (15) | Rainfall amount (16) |
| 5 | Beginning of rain (12) | Bushfire (13) | Flood (15) | Beginning of rain 13) |

**Source:** Field research (2013)

NB: The scores of the three focus groups (i.e., a maximum of 10 for elders, men, and women, respectively) were aggregated (maximum 30) based on the ranking.

Besides drought, the respondents in each community prioritised varied climatic variables, but flooding is not unambiguous. Except for Baleufili, where bushfire was ranked second, the others alternated the two hazards in the second and third positions. During the various interactions, the farmers (and indeed, the community at large) were able to construct the variability in rainfall patterns as they have been experiencing in recent times. Figure 2 is a graphical representation of the rainfall calendars as identified by the farmers.

**Figure: 2.** Rainfall calendar as identified by the local farmers




**Source:** Samaddar et al., 2014

The farmers revealed that they used to experience average rainfall from April to October, peaking in August. Reportedly, this pattern has seen severe variability with the wet season getting shorter. Thus, farmers do not observe rains until the end of July, which resonates with official data (see Samaddar et al., 2015). Participants in FGDs from Chietanga and Bankpama confirmed experiencing annual drought and flooding simultaneously. This means though the wet spell has gotten shorter, the frequency of floods has increased, and this is consistent with Brown and Crawford's (2008) statement as follows:

> *Historical data across the country from the year 1960 to 2000 shows a progressive and discernible rise in temperature and a concomitant decrease in rainfall in all agro-ecological zones [ ... ]. It is estimated that temperature will continue to rise by an average of about 0.6 °C, 2.0 °C, and 3.9 °C by 2020, 2050 and 2080, respectively* (Brown and Crawford, 2008: 23).

The findings are consistent with IPCC projected climate variability impact on agriculture in Africa, which states that the increased frequency of droughts will result in land degradation, lower yields/crop damage, increased livestock deaths and increased risk of wildfire (IPCC WG2, 2007: 18). Further, FES and GAWU (2012) stated that over the last 30-40 years, observations show that Africa is getting warmer: prognoses predict an overall 2.9°C increase in temperature in sub-Saharan Africa by 2060. Antwi-Agyei et al.

(2012) put it aptly by stating that the region [sub-Saharan Africa] is already extremely vulnerable to food insecurity due to climate variability, which contributes substantially to development problems, as key development sectors, i.e. health, agriculture, water, energy and transport are particularly sensitive areas.

Antwi-Agyei et al. (2012) highlighted examples of far-reaching consequences of climate variability in the sub-region, which included a predicted 50% decrease in rain-fed agriculture by 2020, while the number of people suffering from water stress will rise from 15 to 250 million people. Furthermore, local food supplies will decrease due to, for instance, depleting fish in lakes because of rising water temperatures. In the estimation of Antwi-Agyei et al. (2012), the effects of climate variability on Lake Victoria alone could endanger 30 million people who rely on fish as a food and income source.

Our study considered the impact of climate variability on respondents' farms. As indicated in Table 2, all (120) participants cited drought as the most disastrous hazard affecting their agricultural activities (including livestock). The second-ranked impact alternated between storms and flood, with respondents from Bankpama and Zowayeli mentioning storms while those in Baleufili and Chietanga cited floods. Aside from these climatic hazards, some farmers in Baleufili and Chietanga expressed concerns about the destructive activities of monkeys, hippopotami, cattle and birds, some of which were reportedly getting 'closer home' due to the continuous depletion of their natural habitat;

> *These days, we sleep with our foodstuffs else monkeys will come at night and destroy everything. When they get nothing, they mess up the compound and make loud noises that disturb the serenity of the night* [Personal interview with an aggrieved farmer at Chietanga; May 2014].

One of the respondents of Chietanga who has been fishing in the Black Volta for decades remarked metaphorically on the flood menace in the community as "dreams portray things to come".

**Table 2:** Ranking of disasters/climate change phenomena affecting farms most.

| | Baleufilia | Bankpama | Chietanga | Zowayeli |
|---|---|---|---|---|
| 1. (Most common) | Drought (30) | Drought (30) | Drought (30) | Drought (30) |
| 2 | Storms (17) | Flood (24) | Flood (26) | Storms (17) |
| 3 | Flood (13) | Bushfire (20) | Bushfire (14) | Annual rainfall (16) |
| 4 | Animals (13) | Storms (18) | Beginning of rain (13) | Flood (14) |
| 5 | Annual rainfall (11) | Annual rainfall (12) | Annual rainfall (12) | Bushfire (11) |

**Source:** Field research/FGDs (2013)

Our interactions with the KII from the public sector produced useful information. However, contrary to the farmers' concerns, our key stakeholders from the public sector alluded to different climatic challenge. Thus, the public officials ranked bushfire as the prime hazard followed by drought, flood, rainstorm, and epidemics. Though these stakeholders live and work in the same district, there is a glaring disparity between the 'experts' view' and the farmers' lay knowledge', creating a complex subject for public policy. Not only can such a situation affect policy acceptability, but also it can compromise compliance. Admittedly, ideas about lay and expect knowledge underscore recent debates among qualitative researchers, but this paper is not about critiquing the lay-expert divide. Nonetheless, we firmly believe that for the sake of implementable policy which will attract compliance, an exploratory synthesis of the two or an interpretation of one in the light of the other will ensure more excellent conceptual development. Put different, we argue that this lack of coherence is not only an obstacle to effective action, but can potentially contribute to a stalemate on climate policy, a stalemate that matters because climate change in the research locations is real and actions are needed to improve policies and to reduce the vulnerability of people and ecosystems to climate effects..

## Farmers' mitigation and adaptation practices

Table 3 presents results of the local farmers' experiences with the climate menace. As earlier discussed, drought was unanimously cited as a recurring event impacting their livelihoods. This was surprising, as the communities' livelihood activities (i.e. rain-fed agriculture and livestock rearing) show a low degree of diversification, thus rendering them vulnerable to climate variability. The geographical location of the farmers (i.e. isolated, remote, highly underdeveloped and marginalised communities) tends to worsen their plight. During the interactions, it came to light that the farmers lack financial resources and know-how, while support from the government or NGOs is non-existent.

The farmers' major climatic challenge was occasional storms that devastate their crops, livestock, and homes. They recalled how these occasional storms consume large tracks of near-ready grain fields, and at the same time, counted several episodes of late rains during planting seasons. In both scenarios, the ultimate result is poor crop yields, creating food insecurity, which worsens their livelihood and housing conditions and condemns many to extreme poverty. The study revealed that the residents of Chietanga, susceptible to drought and flooding, could move to higher ground. However, that appeared to be a wrenching prospect many would need a fortune (e.g., building materials) to accomplish. Hence, they employ traditional ways to fortify their homes and shore up their coastline. The Chietanga Chief puts it aptly: "after years of inattention and hopelessness and with help coming from nowhere, we have no choice than to do things on our own".

Similarly, in Zowayeli, the farmers generally touted the virtues of the '*good old days*, with

a standard narrative such as the following:

> *When the rainfall was favourable, one could cultivate small parcels of land and harvest a lot. Now it is [rainfall] very unpredictable; we farm larger areas but harvest next to nothing. We are at the mercy of the rains…* [Personal discussion with Chief on Zowayeli: May 2014]

During the FGDs, participants were passionate about their past, a situation which reflected in expressions like:

> *In those days, things were better* [ … ] *in the past, you could harvest a couple of combs of corn from a neighbour's farm for your personal use. All you needed was to inform him about the act* [a community leader at Baluefeli in May 2014]

Admittedly, empirical verification of these experiences of the farmers of "the good old days" with historical data is beyond the scope of this study. Thus, the need for caution in reading these narratives, as "distressed" farmers may unconsciously romanticise the past. Nonetheless, our KII interviewees also confirmed an unprecedented decline in crop yields due to worsening unreliable rainfall patterns and increasing soil infertility. This is also consistent with earlier studies that blamed the continuous use of the same plots and traditional farming practices in the face of increased climatic variability for poor crop yields (van der Geest, 2011). In their studies, Antwi-Agyei et al. (2012) noted, for example, that climate change and variability are having severe impacts on agriculture production and food security, with yields from rain-fed agriculture projected to half by 2020. From their general linear regression model, the combined effect of rainfall and temperature was shown to account for 25.3% of variations in cocoa outputs for Dormaa West District.

Table 3:

| Settlement characteristics | | Chietanga | Bankpama | Zowayeli | Baleufili |
|---|---|---|---|---|---|
| General overview | Population<br>No of years in school<br>Average household size<br>Population growth rate<br>Per capita Income<br>Per capita expenditure<br>Climate<br>Major rainy season<br>Lean (rainy)season<br>Main livelihood activity | 359<br>4<br>6<br>4-8 persons/year<br>¼ of national figure of 240<br>⅓ of national figure of 620<br>- Guinea savannah agro-ecological zone<br>- May – September<br>- April – June/ May.<br>- Rain-fed agriculture (96%) | 742<br>4<br>7<br>6-8 persons/year<br>-same-<br>-same-<br>-same-<br>-same-<br>-same-<br>-same- | 665<br>4<br>7<br>5-7 persons/year<br>-same-<br>-same-<br>-same-<br>-same-<br>-same-<br>-same- | 742<br>4<br>8<br>6-8 persons per year<br>-same-<br>-same-<br>-same-<br>-same-<br>-same-<br>-same- |
| Level of Vulnerability | Major Hazard | - Sea level rise as storm surges<br>- Erosion threatens coastal eco-system and infrastructure.<br>- Storms threaten coastal housing and infrastructure.<br>- Increased economic losses/ crop production failure. | - Water scarcity<br>- (water stress and water-related extremes)<br>- Changes in precipitation patterns reduce reservoir supplies. | - Water scarcity leads to food insecurity<br>- Topography facilitates gully erosion.<br>- Increased distress youth out-migration [loss of livelihood, leading to more work for women] | - Higher temperatures and intense drought<br>- This leads to longer working hours (women wake up early since often, noons are too hot to work) |
| Building resilience | Mitigation.<br>Adaptation | - Construction of coastal mangrove<br>- Irrigation using river water, shallow groundwater extracted manually using buckets.<br>- Farming along river banks<br>- Relying on remittances and less expensive foods, borrowing food.<br>- Reducing non-essential expenditure,<br>- Limiting the meal times<br>- Restricting consumption by adults. | - Artificial restoration of the hydrological system by enhancing water storage and infiltration<br>- Diversity of income with women supplementing family budget with their small scale processing and selling activities. | - Modification of crop production<br>- Planting early maturing varieties<br>- Application of both organic fertilisers and manure<br>- Water savings using mini dams<br>- The sale of assets (livestock)<br>- Diversification of income source.<br>- Migration and remittances<br>- Crop modifications | - Irrigation using mini dams, extracted using pumps and manually using buckets<br>- Resort to charcoal production<br>- Pito brewing by women<br>- Groundwater recharge by wetland restoration & green infrastructure. |

Our interviewees (local farmers) described a number of their adaptation and mitigation strategies (see Table 3). From the table, farmers' adaptation strategies against food insecurity include the sale of (acquired) assets; deliberate reduction of food consumption; diversification of household income, modifications of the crop production and migration. The findings indicate that farmers in the four communities generally sell their livestock (described as "the main safety valve") in times of drought (due to its high market value). Though it was difficult to quantify the value of this farmers' adaptation strategy, prior studies in 2010 estimate the value of the pastoral and meat trade from the district as near US$ 100 million a year (Van der Geest, 2011).

The study revealed that this universal adaptation strategy is purposefully preceded by specific mitigation processes such as adopting early maturing seeds and applying organic fertilisers and manure. The results show that mitigation activities can benefit or hinder adaptation, and promoting activities that contribute to both objectives can increase efficiency and minimise trade-offs, particularly in land-related activities such as agriculture and forestry. Information is however, missing on how climate funding organisations consider the integration of adaptation and mitigation.

Climate-smart practices also appear to be among the standard vehicles for mitigation and adaptation to their local climatic challenges. The study revealed that farmers use drought-resistant seeds, early maturing crops, and irrigation as some of the most preferred adaptation strategies against drought. Our interviewees opined that access to irrigation guarantees security in cultivation and provides them with a more stable income. During the fieldwork, farmers in Zowayeli who engage in dry season farming had to use river water and shallow groundwater extracted manually using buckets.

Apart from spending a significant amount of time daily "searching for water", the farmers conceded that wells and boreholes are not essentially sustainable adaptation strategies since most of them dry up during prolonged drought periods. Further, the community has no mechanism to store and recycle rainwater, possibly due to financial and technical constraints. Additionally, the adoption of drought-tolerant (early bearing) crops and vegetables is a common practice. Still, from the study, the practice is more or less a short term solution due to the post-harvest challenges, including storage and marketing.

During the plenary discussions with the public officials, a member of MoFA gave an example of a new breed of cowpea developed and introduced to the farmers by the Savannah Agricultural Research Institute (SARI) which matures early and cooks faster. The official noted that, due to its earlier maturity period, most married women had described it as *nwubi mong doo*, which means *eat without the husband*. Thus, when an 'irresponsible' husband fails to provide food for the family, the wife can quickly and easily feed her children with that cowpea and pretend nothing has happened since the man will not come from work to find her cooking.

Independent of what is happening generally across the four communities, the findings also show local variations in the farmers' adaptation and mitigation strategies which were mostly driven by local circumstances. For example, some interviewees from Chietanga recalled reducing their "non-essential expenditure including stopping paying of school fees" in times of crisis as a way of financing their adaptation and mitigation activities. Additionally, these farmers as well as those from Zowayeli relied on external remittances to ensure that their adaptation and mitigation are aligned with their local conditions.

During the interactions, there was a general consensus that considering their weak educational background, for most farmers, getting the opportunity to work outside farming is an exception and coincidental. For example, farmers along the Black Volta (i.e. Chietanga and Bankpama) claimed they turned to fishing and charcoal production as alternative livelihood activities. They lauded charcoal production for its quick market, though the gains appear fragile and pose dire long-term implications. The most commonly cited impact of charcoal production is deforestation, i.e., the clearance of forest or woodland. For example, the cutting of trees along the Black Volta exposes the river to evapotranspiration. This explains why the river is rapidly drying up and impacting its bio-diversity. Further, the illegal use of economic trees - shea tree – affects the women's shea butter trade, creates deforestation and increases the incidence of bushfires and impacts on soil fertility. Charcoal production in tropical regions of the world is often perceived to have devastating ecological and environmental effects.

Contrary to the literature (see Awumbila et al., 2014), migration down-south was not among the most preferred adaptation strategies for the elderly, but a commonly adopted one nonetheless. This is particularly so in recent times, when migrants stay longer before returning, if at all. The farmers opined that migration drains away their able-bodied youth (at the expense of the aged), thus consigning their communities to imminent food insecurity.

During the FGDs, farmers along the Black Volta noted they rely on local knowledge for early warning signals and only occasionally on those from the metrological agencies, albeit such warnings often come at too short notice to be useful. The farmers opine that 'timely' notifications using appropriate channels will prepare them better against climatic variability (i.e., through field preparation, seed sowing, and water management). Such information is imperative, as their long-tested traditional knowledge relating to seasonal predictions is fast disappearing and increasingly becoming unreliable.

FES and GAWU (2012) corroborated the observation by noting that global climate change is one of today's greatest challenges and therefore it is crucial for all countries to act now. They reiterated that society is at a cross-roads and only decisive and immediate action will make it possible to influence the future consequences of climate change and stall global warming. In their estimation, the key is mitigation, and all countries have the

opportunity and the obligation to be part of the solution to a global problem. They rightly maintained that it is of fundamental importance that adaptation to dangerous climate change, as well as its prevention, is placed at the top of the political agenda. Concluding, they noted that countries' policies to eradicate poverty, ensure food security, as well as to provide education and health services need to include adaptation strategies.

## Looking for synergies in local adaptation and mitigation

Our findings revealed that our study communities are facing climate-induced challenges. The challenges, which are becoming severe, frequent and costly by the day, cover everyday hazards like water scarcity in Zowayeli and Bankpama, land degradation in Baleufili and severe storms in Chietanga. These study communities, marginalised geographically and politically and with no official assistance, are vulnerable to everyday hazards like living and working in unsafe areas, being under-educated and illiterate, poor with fragile and often hazardous livelihoods, and being individually and collectively politically weak (Grant and Oteng-Ababio, 2016). This section explores opportunities for policy integration embedded in the farmers' local strategies for adaptation to and mitigation of climate change, a conceptual synergy. Dang and et al. (2003) described as a "cause and effect" interaction. In their opinion, future adaptation is related to current mitigation levels. Willbanks et al. (2007: 714) also remark that "if mitigation can be successful in keeping impacts at a lower level, adaptation can be successful in coping with more of the resulting impacts".

In this instance, data paucity makes this study imperative. The various adaptive actions of the farmers have consequences for mitigation (positive or negative). The question then is whether their mitigation actions impact future adaptation since these local strategies are direct and involve the same resource base and the affected stakeholders. Thus, the people of Zowayeli and Bankpama reported acute potable water scarcity, which remains the single biggest threat to human health and economic livelihood (Samaddar et al., 2015). During the fieldwork, the farmers displayed great consciousness of the recent late arrival of the rains, a shift they aptly tie to climate change.

The community of Baleufili, for example, is privileged to have a mini-dam that provides them with sustained annual drinking water. It also guarantees small-scale irrigation and recession farming which serves as an essential component of their local livelihoods. Yet, the fact that the farmers and their livestock share the same mini-dam, particularly in the long dry season, has serious health implications (Samaddar et al., 2015). It stands to reason that though the mini-dam is a vital adaptation asset, it can also be a source of everyday hazards by providing a conducive environment for the breeding mosquitoes and spread of malaria and other vector-borne diseases.

Similarly, in Baleufili, as in Bankpama, charcoal production is rife, a traditional adaptation strategy among men. Although the practice is widespread due to its fast and high-income generating potentials, it risks compromising the long-term sustainability of the community due to its embedded negativities - increasing trans-evaporation, bushfires, deforestation and soil degradation of already fragile (infertile) soils (Samaddar et al., 2015). However, adopting an integration of adaptation and mitigation strategies that consider more efficient use of energy can promote land-use development that supports local economies and livelihoods (e.g. shea butter, fishing, etc.) and help maintain biodiversity in the Black Volta (Kansanga et al, 2020).

Again, the village of Chietanga on the banks of the Black Volta is battling with the sessional storms, which are eroding farmlands. The flooding of the river has become so severe in recent times that the Chief of the village recalled during the FGD as follows:

> *The last big storm in 2012 came close to inundating the whole village … That was pretty scary. It seemed like the water would run right over and cover us up, but thankfully it didn't. Though no human casualty was recorded, residents who farm within the river valley lost all their investments. I am wondering what the storm will be in August* [Personal interviews with Chietanga Chief, May 2015]

The farmers, who are menaced by the flooding, create coastal mangrove plantations as a makeshift barricade to build their resilience to the sessional storms. In our view, the mangrove plantations, when properly integrated, can sequester carbon, reduce future climate change and serve as a safety net for the farmers against droughts. This resonates with Ayers and Huq's (2007: 761) remarks that "this creates a neat mitigation-adaptation-sustainable development nexus: the composting mitigates GHGs directly through reduction of methane emissions and indirectly by contributing to carbon sequestration of crops; adaptation through soil improvement; [and] sustainable development because poverty is exacerbated when climate change reduces the flows of eco-system services".

In Zowayeli, the residents contended that the severe drought threatened indigenous farming practices and drinking water supply systems. They acknowledged that the rainy periods are getting shorter, yet erosion is becoming so severe mainly due to the settlement's physical topography and increasing human activities. This, the residents noted, is affecting their farmlands and threatening food security. During the fieldwork a widow (about 70 years old) was seen preparing an almost barren land in expectation of the uncertain rains. In an interview, she revealed the challenge in getting a meal a day. She remarked:

> *Nowadays, most of the villagers interpret the lack of smoke from a household in the evening to mean that the occupants will bed on an empty stomach. To avoid such a social stigma, most families make fire and boil water to bathe their*

> *grandchildren, whose mothers might have migrated to the city to look for a job to supplement the family income* [Interview with a 70-year older woman].

Though some farmers have resorted to harvesting rainwater during the short rain spell or water savings with the construction of mini-dams to support irrigation, these are not enough to survive the long dry period. Besides, the increasing adoption of energy-intensive irrigation by introducing small generators can also inadvertently increase carbon emissions and exacerbate climate variability (Moser, 2012; Kansanga et al, 2020). This underscores the importance of synergising adaptation and mitigation strategies so that their socio-productive dimension can be enhanced.

One common mitigation strategy is the farmers' preference for investing in male education to the detriment of the girl child based on the perception that girls "are to be married off". The practice encourages early marriages (Awumbilla and Adarfio-Schandorf, 2008), which worsens poverty levels. This ultimately potentiates the North-South migration of the youth in their quest to improve their resilience (Oteng-Ababio, 2020). Similarly, the adoption of drought-resistant, early harvesting seedlings as an adaptation strategy also leads to a situation where the farmers will have to contend with post-harvest losses occasioned by inadequate storage facilities and marketing opportunities.

Progress with either mitigation or adaptation at the local level can impact the other. This mimics remarks by Jones et al. (2007) that the demand for mitigation measures is highest when the adaptive capacity is exceeded, implying that the supply of mitigative capacity must emanate from local adaptation strategies. This calls for accepting that 'rural' is broader than just the 'agriculture' sector and is linked to other sectors involved in local development. Indeed, the Fourth Assessment Report of IPCC articulated the peculiarities of climate havoc on the African continent thus:

> *Agricultural production, including access to food, in many African countries and regions, is projected to be severely compromised by climate variability and change. The area suitable for agriculture, the length of growing seasons and yield potential, particularly along the margins of semi-arid and arid regions, are expected to decrease. This would further adversely affect food security and exacerbate malnutrition in the continent. In some countries, yields from rain-fed agriculture could be reduced by up to 50% by 2020* (IPCC 2007: 13).

This calls for integrative adaptation and mitigation strategies in addressing climate change effects in rural areas. Adaptability and sustainability depend not only on technological innovations and the rationalisation of production and consumption, but also on seeking permanent socio-cultural innovations and a renewed political interpretation of resources (Beduschi and Faret, 2016). There is a need to develop a funding architecture capable of supporting marginalised communities and their institutions since any intervention is only as effective as its local institution. Even where the government provides services, the

institutional arrangement for the on-the-ground implementation often involves the local communities and their institutions.

Exploring local synergies between mitigation and adaptation can address climate-induced challenges by reducing costs and increasing co-benefits. Such a synergy is mainly synonymous with development and can increase adaptive capacity, reduce vulnerability and encourage socio-economic development pathways that mitigate emissions. Ultimately, linking the two at the local level may make mitigation options more attractive, generate incentives to strengthen the local mitigative capacity, and influence the authorities to align the mitigation strategies more closely with climate change priorities.

## Conclusion

We sought to explore the synergy of inter- and intra-community mitigation and adaptation responses in the four research communities in Wa West. This concluding section answers the initial questions posed: Can local communities' mitigation and adaptation conflict with one another? And can the adaptation and mitigation response options also cooperate and synergise? Our results conclusively indicate that attempts to separate adaptation and mitigation responses in climate science and policy can hinder the progress in addressing climate-induced vulnerabilities.

Instead, our findings underline the importance of exploring their local synergies by considering adaptation activities that have consequences for mitigation and vice versa. This is consistent with the study by Klein et al. (2007) which point to some of the pathways through which these synergies may be explored. Agreeably, individual community members are no experts in climate policy, nor do they have much genuine interest in its causality. They nonetheless have a role in its cause and, by extension, the pathways to addressing the outcomes through their livelihood activities.

This observation is particularly imperative due to increasing environmental fragility and the virtually non-existent future climate policy and adaptation priorities at the local level. This study has pioneered the conversation on the need to explore the synergies between climate change adaptation and mitigation responses as a way of bridging the gap between local priorities and national commons. We have examined these in a case study of a fragile eco-system where ordinarily, local farmers' adaptation needs are high and mitigative capacity is low (Samaddar et al., 2015). The research shows encouraging synergies between the two at the local level, though the results may not be a magic bullet for a comprehensive climate policy.

Concluding, we acknowledge that the theoretical debate underpinning the issues is hardly a new one. However, given the relatively short history of climate change discourse

in Ghana, there appears to be a strong case for scaling up the efforts to research, educate and encourage combined mitigation and adaptation policy initiatives at all levels. This will empower the local farmers and create active citizenship at the local level capable of holding governments accountable. The current desperation to escape poverty and ensure financial sustainability within the fragile eco-system serves to crowd out social mobilisation, favouring individualism. And there are understandable reasons why most individuals might be reluctant to take on a mobilising role, mainly when they feel least responsible for the current climatic variability. Therefore, their desirability and potential for mitigating opportunities are low.

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