

Vulnerabilities and capacities: Dealing with coastal flooding in Ghana's Volta Region

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Abstract

Coastal flooding events pose an existential threat to populations around the world, particularly in the Global South. As a result of climate change and other, direct forms of anthropogenic interference, the magnitude and frequency of such floodings is predicted to continuously increase in the near future. Therefore, it is important to understand the vulnerability of affected people to implement appropriate measures. This research presents a case study on coastal flooding and its impact on livelihoods in the Volta Region of Ghana. The paper utilizes a vulnerability framework that focuses on exposure, susceptibility, as well as the capacities to anticipate, cope with, and recover from the effects of natural hazards. Based on a qualitative approach, the study focusses on those households who were directly affected of a severe tidal flood in November 2021, leading to a total destruction of their property. The research was conducted in March, July and August 2022. It revealed that the studied group had low capacity to anticipate and had no contingency plans in case of relocation. Further, we discovered different strategies that people applied to deal with the situation eight months after the flood event. Most households applied (short term) coping strategies to reestablish their former marine-based livelihood systems. Adaption in terms of long-term adjustment of their livelihoods played only a minor role and could be found in form of out-migration in a limited number of households.

Keywords: Fishing Community; Climate Change Adaption; Crisis migration; Displacement; Relocation

1. Introduction

In November 2021, inhabitants of coastal settlements in the Volta Region of Ghana were subjected to a severe tidal wave flooding. In the Ketu South Municipality and the neighbouring Keta Municipal District, 3,000 individuals were displaced as a consequence of the storm surge. A significant number of these individuals lost their homes and a substantial portion of their property (Osisiadan, 2021). Over recent years, such flooding events have become increasingly prevalent among coastal communities worldwide. These events are not only becoming more frequent but also more intense. Without any form of protection or adaptation, up to 246 million people could be affected by 2100. Furthermore, it has been argued that countries in the Global South, particularly in Asia and West Africa, are disproportionately affected (Kirezci et al., 2023). The West African coastline extends over 6,000 kilometres, encompasses 14 countries, and is home to approximately a third of the region's population. Furthermore, it contributes significantly to the GDP of these countries (Alves et al., 2020). The coastline is subject to accelerated degradation due to coastal flooding and inundation, which are recognized as a result of climate change due to rising sea levels (Nicholls

& Cazenave, 2010; Kirezci et al., 2020, 2023; Mensah et al., 2017; Aman et al., 2019). In addition to the rapid onset events of coastal flooding, which cause significant destruction, the coastal areas in the Gulf of Guinea are affected by erosion processes (Dada et al., 2020). These processes are likely to increase further in the coming years due to ongoing climate change and human activities exacerbating these effects (Aman et al., 2019).

In the degradation process of the shoreline, human interference plays an important role. Longshore wave-driven sand is of significant importance for the maintenance of the coastal barrier, as it compensates for losses resulting from natural erosion (Giardino et al., 2018). River dams and major sea ports, such as the Akosombo Hydro-dam and the ports of Tema and Lomé, have been identified as having a negative impact on the sediment supply in Eastern Ghana and the Bight of Benin (Boateng, 2012a; Laïbi et al., 2014; Ly, 1980). Boateng (2012a:392) showed that the average erosion rates vary across the country: between 1.6 meters in the western region and up to 3.9 meters per year in the eastern coastal section of Ghana. A combination of the gradual increase in sea level and the sudden rise in storm surges, exacerbated by human-induced erosion processes, has led to an increased vulnerability of previously unimpacted land to flooding (Addo et al., 2012). This

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renders the eastern coast and its inhabitants particularly susceptible to the effects of storm surges and tidal waves, which have become a near-annual phenomenon in the 21st century as a consequence of climate change (Boateng, 2012a, 2012b). While some coastal areas are protected by breakwater infrastructure, many others remain unprotected by technical and highly cost-intensive infrastructural adaptation solutions. Consequently, it is of equal importance to understand the vulnerabilities of those affected by natural hazards and climate change, as it is to implement mitigation strategies (Birkmann et al., 2013).

This paper presents a qualitative case study on a community in southeastern Ghana in the context of coastal flooding. The focus is on aspects of vulnerability and the capacities of the community to cope and adapt. A qualitative approach was employed to analyse the various dimensions of vulnerability and to discuss the coping and adaptation strategies employed by households in the coastal village of Agevadzi some months after they were forced to relocate due to the loss of their houses and property.

The debate on natural extremes in the wake of climate change is closely connected to the discussion on migration. In the Groundswell Report II, published by the World Bank, migration is directly linked to climate change. The authors posit that by 2050, up to 216 million individuals may be internally displaced within their country due to climate change and natural extremes, such as droughts and flooding (Clement et al., 2021). Our study is part of an international research project on Migration and Climate Change in West Africa (Mitra|WA)² and funded by the German Federal Ministry of Education and Research (BMBF). Hence, we also look at the role of migration as a short and long-term strategy to adjust.

The remainder of this paper is structured as follows: Chapter 2 introduces the concepts of vulnerability and livelihood. Chapter 3 presents the research design and methodology. Chapter 4 presents the case study area and the studied group of households. Chapter 5 presents and discusses the results of the research. The paper concludes with a summary of the findings, presented in Chapter 6.

2. Vulnerability and livelihood

Although White's statement that "*Floods are acts of God, but flood losses are largely acts of man*" (White, 1945: 2) no longer fully applies in times of man-made climate change, it is even more important to analyse the losses and the impact on the community, households, and individuals. The vulnerability approach was chosen as an analytical basis.

The applied framework is based on three elements of vulnerability (exposure, susceptibility, and capacity) which are widely used in current definitions of the concept (Jamshed et al., 2020), informed by the sustainable livelihoods approach (DFID, 1999).

Following an earlier definition by Chambers & Conway (1991), the sustainable livelihoods approach, understands a livelihood as follows:

"A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base" (DFID, 1999:1).

A livelihood system is shaped and influenced by various factors and processes, such as the vulnerability context, the interrelated transforming structures and processes as well as the availability and form of livelihood assets. Livelihood strategies, i.e. ways of combining and using assets to achieve certain livelihood outcomes also play an important role. These outcomes are for example achieving higher income, having good health conditions or improved food security (DFID, 1999).

To analyse the vulnerability context of a livelihood system, the above mentioned three elements of vulnerability (exposure, susceptibility, and capacity) are now introduced.

Exposure is understood as "*the extent to which a unit of assessment falls within the geographical range of a hazard event*" (Birkmann et al., 2013: 200), including physical characteristics of human systems (livelihoods, culture) and social systems (infrastructure) that are geographically tied to particular practices and resources, which might be affected as well. Exposure can be qualified along spatial and temporal patterns (Birkmann et al., 2013).

Susceptibility describes the fragility or the sensitivity of a system towards a hazard event. It is defined as "*the degree to which a system is modified or affected by hazard or climate variability. [...] It describes the characteristics and condition of a system which differentiates the magnitude of impacts for a given exposure*" (Jamshed et al., 2020: 7). These characteristics refer mainly to negative characteristics and deficiencies in the setting of a system, e.g. social, economic, physical, institutional, or environmental conditions (Birkmann, 2011; Birkmann et al. 2013).

Capacity refers to the available resources and strengths "*to manage and reduce disaster risks and strengthen resilience*" (UNDDRR, n.d.: 12) while combining coping and adaptation capacities. Coping refers to the short-term ability to overcome immediate impacts of a (natural) disaster event and is mostly orientated towards survival. In contrast, adaptation is orientated towards a long-term process of changing the livelihood system in accordance to potential hazards (or climate variability) such that in case of disaster, important activities can be maintained without losing important assets or goods (Birkmann, 2011; Jamshed et al., 2020). Moreover, the process of recovery can be included as a form of capacity as well. Smith and Wenger (2007: 237) define recovery as "*the differential process of restoring, rebuilding, and reshaping the physical, social, economic, and natural environment through pre-event planning and post-event actions.*"

² <https://www.uni-passau.de/en/mitrawa/project>

However, it is to note that recovery does not necessarily mean to restore the pre-disaster conditions as this might preserve vulnerable conditions (Jordan & Javernick-Will, 2013). To assess vulnerability in a holistic way, Birkmann et al. (2013) identified the following key dimensions, which have to be addressed when understanding vulnerability:

- social (adverse effects on human well-being);
- physical (damages on physical assets, including infrastructure and built-up areas);
- economic (loss of income and economic value due to destruction of physical assets or the disturbance of economic activities);
- cultural (e.g. loss of places and items of meaning and impacts on practices);
- environmental (damages on ecological and bio-physical systems and their functions);
- and institutional (impacts on governance systems in their organizational form and function).

Figure 1 illustrates the interrelationship between the three core elements. A livelihood system may be highly exposed and susceptible to a hazard event, yet if the available capacities are sufficiently robust, this may result in a relatively low vulnerability. Conversely, a system that is less exposed may nevertheless experience a higher vulnerability, contingent on the available capacities.

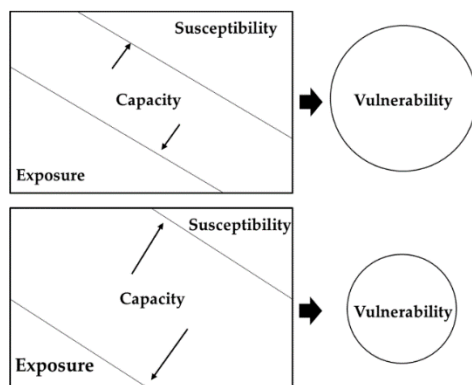


Figure 1: Core elements of vulnerability.
Source: Jamshed et al. (2020:8)

3. Methodology, research design and research area

3.1 Methodology and research design

To approach, assess, analyse and understand socio-ecological phenomena of climate-change adaption, an iterative process based on the Grounded Theory Method (GTM) approach was used (Strauss & Corbin, 1990). Pinsky et al. (2019: 469) suggest that: “*inductive grounded theory methodology rather than logical-deductive approaches, is an appropriate and effective method for studies where existing theories are incipient, and the phenomenon studied is highly complex due to its multi-disciplinary and diversity of actors involved.*” In March 2022, a preliminary investigation was conducted to gain initial insights into the structures, processes and actors involved in the context of research on natural hazards, flooding and adaptation measures. The data and information gathered through open

discussions and interviews with local stakeholders were used to select the methods of semi-structured interviews and a small survey to cover quantitative data, which were used to conduct the main study in July and August 2022. During the data collection process, the data was subjected to constant reflection and analysis, with the interview questions undergoing constant adaptation. Additionally, the vulnerability concept emerged as a suitable theoretical framework for in-depth analysis of the data.

The flooding has resulted in the temporary displacement of 480 individuals and the destruction of 72 buildings (NADMO Officer, interview, 22 July, 2022). Initially, a random sample of 20 permanently displaced households, comprising 165 members in total, was selected from the affected community to participate in a brief survey. This was conducted to obtain basic information about the household composition, socio-economic information, and migration status. The questionnaire was derived from a survey conducted as part of a larger research project on climate change and migration throughout West Africa (Wehner et al., forthcoming)

In social science research, especially within contexts of vulnerability, establishing a connection with informants is crucial (Thurairajah, 2019). Accordingly, the initial household visit was intended as an opportunity to initiate contact with community members. During the subsequent phase of the field study, all these households were revisited for follow-up semi-structured interviews. With an established rapport and a clear understanding of the study's objectives, individuals were more forthcoming in their responses. This approach not only enabled affected individuals to share their experiences from their own perspectives but also helped uncover new topics of interest. Thus, the method of semi-structured interviews proved suitable (Bernard, 2002). The interviews primarily explored the impacts of the November 2021 flooding on households, as well as their coping and recovery strategies and the challenges arising from those strategies. This approach also facilitated an understanding of the challenges arising from the strategies employed.

The interviews were – with the permission of the interviewees – recorded, transcribed, and denaturalized (Azevedo et al., 2017) mostly directly after the interview took place, inducing a first step of comparing, analysing and categorizing the data.

Data from the 20 semi-structured qualitative interviews was analysed using the qualitative content analysis, mainly based on Mayring (2015). The transcripts of these interviews were analysed regarding the explicit and latent meaning of the answers given in the interviews. This analysis is based on a category system which is mainly derived from the theoretical literature regarding vulnerability (see chapter 2). Some additional (sub-) categories were derived inductively, i.e. based on the material. The categories are presented in Table 1.

Category	Definition
Temporal & spatial exposure	The temporal and spatial extent that a household was directly affected by the flood.

Destroyed and lost physical assets	All physical and material things, including buildings, machinery, tools, and livestock that were lost due to the flood.
Impact on income	Adverse effects on the income strategies of a household due to the flood.
Health related issues	Adverse health effects associated with the flood.
Impacts on education	Negative consequences for the education of household members related to the flood.
Capacity to anticipate	Strategies and resources to reduce risk prior to the flood, including the impact of available and unavailable strategies and resources. .
Capacity to cope	Strategies and resources to deal with the immediate impacts of the flood in the short to medium term which are mainly directed on a compensation of certain impacts; including the impact of available and unavailable strategies and resources.
Capacity to recover	Strategies and resources directed on the restoration and rebuilding of adversely affected aspects of a livelihood system; including the impact of available and unavailable strategies and resources.
Adaptation strategies	Long-term strategies to respond to the flooding situation and their impact on the household.
Reason for migration	All reasons for migration connected to the flooding.
Destination	Destination of migration including the locality as well as important contacts at the area of destination.
Duration	Duration of the migration.
Impact on household	All impacts on the household in relation to the migration.

Table 1: Categories for content analysis

3.2. Research Area: The Case of Agavedzi

The research was conducted among a fishing community in the village of Agavedzi, located in the southwest of the Ketu South Municipality in the Volta Region, Ghana. The Ketu South Municipality is located between 6°3' N and 6°10' N latitude and 1°6' E and 1°11' E longitude. The village is nestled between a lagoon in the north and the ocean in the south and extending along the road connecting Keta and Aflao.

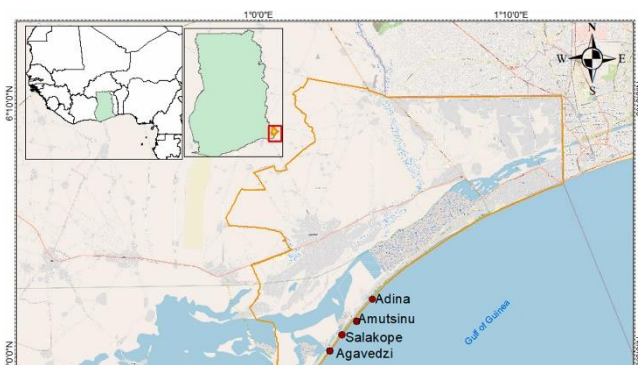


Figure 2: The location of Agavedzi.

Source: Babanawo et al. (2022 : 4)

In 2010, Agavedzi had a population of about 2,400 inhabitants, the Ketu South Municipality a population of 160,000, which increased to 253,122 in 2021 (Brinkhoff 2021). This increase is not only to be tributed to high birthrates, but also driven by immigrants from neighbouring West African countries who engage in commercial activities within the Municipality (Ghana Statistical Service, 2014; Ketu South Municipal Assembly, 2023). Showing the general importance of migration in this area, Hillmann and

Ziegelmayr (2016) find that out-migration is commonly practiced in Keta as part of daily life and shaped at least partially by translocal connections. For instance, fishermen in the region are known to regularly migrate to Togo and to Accra (Yaro, 2010). The area is predominantly populated by individuals belonging to the Ewe ethnic group, which has a long history of migration (Hillmann et al., 2020; Kraan, 2011). Hillmann et al. (2020) emphasize that environmental considerations alone are not a significant factor in migration decisions.

Agricultural activities in the municipality are constrained by the environmental conditions. In 2014, only 17.3% of the population above the age of 14 were employed in the primary sector (agriculture, forestry, fishery) (Ghana Statistical Service 2014). The fishing sector, which encompasses activities in the sea, rivers, and lagoons, as well as aquaculture, plays a significant role in the area. Consequently, the share of agriculture and forestry within this sector can be considered to be relatively low. This low figure is in stark contrast to the situation in Ghana as a whole, where the share of employment in the primary sector was 40% in 2014 and 2021 (World Bank, 2023). In the settlements located directly at the sea, the significance of fishing as a source of income is considerably greater. In the research location, most households rely on fishing or the processing of fish (smoking and frying) as their primary source of income. Other significant sources of income include salt mining, services such as hairdressing and tailoring, the sale of commodities, and work as a daily labourer.

As described above, the eastern part of Ghana's coast is highly prone to the impacts of coastal degradation and flooding. As a technical solution to natural hazards, the sea-defence project was completed in Keta in 2014. It consists of about 50-meter-long groins constructed about 50-100 meters apart in a right angle to the shore. Starting from Keta, the sea-defence has been expanded along the coastline to the east, but not all the way through, leaving some stretches unprotected. It has now reached the village of Agavedzi; however, it only protects two thirds of the village's shore. The western part of the village and the remaining shoreline towards the Togolese border remain exposed to the sea. Babanawo et al. (2022) show that the coastal communities of the municipality face a highly unequal vulnerability to coastal flooding and its impacts.

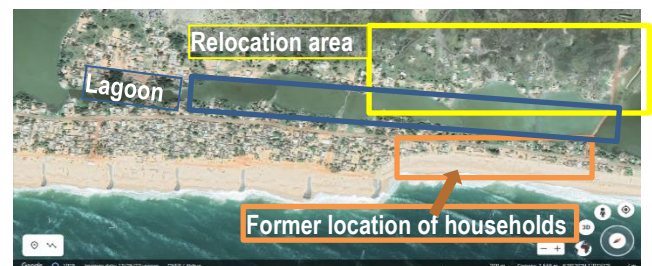


Figure 3: Aerial picture of Agavedzi and relocation site. Based on Google & Airbus/CNES (2022)

The aerial photograph (Figure 3) depicts a portion of the village of Agavedzi, highlighting the resettlement area of the displaced community. The width of the beach, which is unprotected by the breakwaters, has been significantly diminished in comparison to beach sections that are protected. This finding corroborates concerns that large-scale technical solutions can have serious consequences.

This phenomenon has been described by Addo et al. (2012) in their study on shoreline change in Keta. The aforementioned phenomenon becomes apparent here: The substantial structures exert a considerable influence on oceanic currents (and the associated sediment distribution) at the regional level, with adverse consequences for the western coastal sections. This once again demonstrates that the impacts of tidal wave flooding are not solely a consequence of climate change, but also of anthropogenic interferences at the regional and local levels.

4. The study group and analysis of their vulnerability

4.1 The studied households

In total 20 households, with an average of six individuals above the age of ten, participated in the study. As illustrated in Figure 3, this community was previously situated on the beach and has since relocated to an area of land situated behind the seasonal water body. The data collection on the income-level was challenging as the participants were reluctant to talk about financial issues. However, it became clear from our observations that the households can be considered socio-economically challenged and operating close to or below the absolute poverty line. The majority of households rely on fishing as their primary source of income, a practice that is not uncommon among coastal communities in Ghana (Ofori, 2021). In their 2020 study, Mensah and Antwi found that artisanal fishing communities are characterized by low income and poor living conditions. *“Incomes in fisheries are highly variable; it depends on the weather, the luck, the timing, and the season”* (Kraan 2011:163). In the best of circumstances, the majority of these households are socio-economically challenged, with a significant proportion operating below the absolute poverty line. Furthermore, the lack of involvement in subsistence agriculture results in the necessity for households to expend cash on the purchase of staple food and vegetables, even though a significant proportion of these households are able to supplement their protein intake through the consumption of aquatic products.

The educational level of the population is generally low. Economic activities outside fishing include low-skilled manual jobs as daily laborers, petty traders and service providers, as well as some skilled trades such as carpentry, hairdressing and tailoring. Some find income generating opportunities in the adjacent salt mines.

As mentioned above, migration is an important aspect of livelihoods in the Volta region. Prior to the flooding, almost half of the households were translocally organized. In this context, we define translocal organization as households with members who live in another location and the households are connected via material or immaterial

exchange as defined by Steinbrink and Niedenführ (2020). However, among the studied households remittances do not play a major role in the household-economies of the selected households.

4.2 Assessing the Exposure and Susceptibility

In terms of exposure as defined in Birkmann et al. (2013) (see Chapter 2), the studied households are, or were previously located in a highly hazard-prone area. The community's livelihood was inextricably linked to its maritime location, both in terms of housing and income generation. As is the case with coastal communities around the globe, the exposure level of this community has increased significantly over recent years. All houses of the study participants were affected by the flooding in November 2021. This implies that the houses were inundated and largely destroyed. This may also include the loss of items or livestock kept around the house. The tidal wave flooding commenced in Agavedzi in the early morning, which implies that there was a paucity of time to collect valuables, personal belongings and salvage building materials.

In terms of susceptibility, the data does not allow for meaningful comparisons between the different households. Nevertheless, two general issues can be identified:

(i) The houses are constructed directly on sandy ground without an adequate foundation. The absence of a foundation renders the sand below the building susceptible to erosion. In the event of flooding, these structures are highly susceptible to instability, with the potential for them to be washed away or collapse. Figure 4 depicts a house that was destroyed by the flood. The erosion of the sand foundation led to the collapse of the concrete walls.



Figure 4: Affected house in Agavedzi.
Source: Own photo with permission of the residents.

(ii) The proximity of the houses to the ocean rendered them more susceptible to damage than those situated further inland. In many instances, the loss of fishing and smoking equipment constituted a significant setback for households residing in these coastal areas.

4.3 Dimensions of Vulnerability

In order to gain further insight into the vulnerability assessment proposed by Birkmann et al. (2013) (see Chapter 2), it is necessary to consider the social, economic and cultural aspects of the data. In practice, it is evident that these dimensions are interwoven and cannot be clearly separated from each other. For the sake of simplicity, the categorization presented here is uncommented, pragmatic, and not exhaustive.

a) Social Dimension

(i) Impacts on human health: The disaster had a profound impact on the households, resulting in significant physical and psychological distress. Three members of the studied households perished during the flood, and four individuals sustained serious injuries. The sudden and rapid rise in sea level caught some of the families unaware, causing further hardship and distress. Two households even experienced the loss of one family member as a consequence of flood-related psychological trauma. The victims of the flood continue to suffer trauma related to the event, with one participant stating: *“The sea’s destruction was something very heavy on*

my psyche. And my husband has died as a result of that. My three houses are in the water now.” (2 August 2022) The loss of life and health is a heavy burden for all affected households, challenging both well-being and the capacity to recover.

(ii) Loss of home: The destruction of the house is not merely a matter of the loss of the material structure itself; it also entails the loss of the social and cultural capital embedded in the house. This represents a significant loss for the family, as the home is an important element of the social fabric of Ghanaian society.

b) Economic dimension

(i) Direct impact on household and business assets:

All households were forced to abandon their residences and their household equipment and utensils, valuable items, and in many cases their cash savings. In addition, many also lost a portion of their economic capital, including fishing equipment, ovens and other equipment for smoking fish as well as tools and equipment for other crafts and of stores and the stocked goods.

(ii) Negative economic impact beyond the household:

The households who offer services also have their business negatively impacted by:

- As a consequence of the flooding individuals have less disposable income, which in turn affects the purchasing power of the local community.
- A reduction in the number of customers can be attributed to the outwards migration of individuals and families due to the flood.
- The loss of an accessible, well-known, and central location close to the road represents a significant challenge for the local affected businesses.

The aforementioned issues can be exemplified by the following quote from a mother about her daughter, who is a hairdresser: *“People don’t know where she lives. [...] People normally come to her in the house. But since [we] moved here, people are no longer coming.”* (Interview, 2 August, 2022)

c) Cultural dimension:

The villagers had to move from their traditional location on the coast. They were used to and cherished their livelihood literally on the beach, living by and from the sea. Our research indicates that the villagers have a strong attachment to the place. The seaside location is associated with cultural and socio-economic meaning. This is consistent with the findings of Tenbrink and Wilcock (2023), who also suggest a higher level of place attachment, particularly among rural populations, in the context of climate change. The coast and the proximity to the sea are imbued with a sense of significance, holding a high cultural and social value. The relocation has affected the cultural identity of those who have lived as coastal dwellers. A local chief highlighted the community’s reliance on the coastal area.

“Periodically, we suffer from sea erosion. When it happens, we suffer a lot. And we cannot go to any hinterland to go farm [...] You can’t go. We’d rather stay and face any challenge from the sea.” (Interview, 4 August, 2022)

d) Ecological dimension:

The environment was significantly impacted by the loss of land mass and the salinization of the area. By extrapolating the past flood events in terms of frequency and intensity into the future, it can be seen that the area is no longer suitable for habitation for any length of time. The coastal area is at risk of becoming uninhabitable in the long term unless infrastructural protection measures are implemented.

e) Education as an overarching area of vulnerability:

In Ghana, education is a highly significant aspect that encompasses and unites social, cultural, and economic dimensions. Education is regarded as a cultural and social value, offering pathways to a better future, particularly through enhanced income opportunities and the ability to access more prestigious employment. However, the cost of education is a significant barrier for many households, particularly in the context of post-flood recovery. As illustrated by the following quote, many families reported that they lacked the financial resources to support their children’s education. *“Right now [we] don’t have anything to use to work. Due to that, how to take care of the kids that go to school? [We] are not able to pay that, so the kids are now in the house”* (Interview, 29 July, 2022). The consequences of this phenomenon extend beyond the limitations imposed on older children who are unable to pursue higher education (university or technical training). It also affects younger children attending primary school. In the long term, this also has a negative impact on the economic welfare of households, as there is a strong correlation between education level and income prospects.

With regard to the dimensions of vulnerability, all households were severely affected in at least four out of the five aspects described. In addition to the loss of their geographical space and the home they are culturally attached to as beach dwellers, the 20 households experienced significant setbacks in their socio-economic situation and development. However, given the diversity of the twenty households in terms of their socio-economic characteristics and the variations in their livelihood systems, it is evident that they have disparate capacities to cope with the situation following the disaster. This will be addressed in greater detail within the context of vulnerability in the subsequent chapter.

5. Capacities to anticipate, cope, and adapt

This chapter presents and discusses the main findings from the study. It is structured along the elements of vulnerability as presented above: First, the capacity to anticipate, second, the capacities to cope and recover, and thirdly adaptation strategies, including the role of migration.

5.1 Capacity to anticipate

This section will examine the relationship between the capacity to anticipate and vulnerability.

In order to provide a more comprehensive understanding of the situation, it is necessary to provide some background information regarding the relevant institutions. The National Disaster Management Organization (NADMO) is the government agency responsible for the management of disasters in Ghana. Its responsibilities include the provision of relief items and rehabilitation services for victims of disasters (Ministry of the Interior, 2023). According to a NADMO officer (Interview, 22 July, 2022) from the Ketu South administration, another awareness raising and education to communities about local risks is also a major task. From his experience, moving away from the coast is particularly difficult for those who live close to the coast and depend on fishing. Consequently, it is evident that resettlement in anticipation of potentially destructive flooding is not a viable option for the majority of those who may be affected.

Despite the awareness workshops conducted by NADMO, the household interviews revealed a striking lack of preparedness among the study group. A mere one in 20 households had taken any preparatory steps in the event of a tidal wave flood. In nearly all of the interviews conducted, the participants indicated that they did not anticipate being affected by the flooding. Despite observing the demolition of houses in Agavedzi and the surrounding villages, the respondents believed that they would remain unaffected.

The following three cases can be distinguished:

(i) One household demonstrated a high level of anticipation by commencing construction of a second residence prior to the flooding in November 2021. The household had previously been affected by flooding and was encouraged by their extended family to commence construction of a new house in anticipation of future flood events. Notwithstanding the fact that the new house at the new location was not yet complete when the old house was destroyed by the flood, the household benefited when they were finally able to move in after the construction was completed.

(ii) One household illustrates the issue of low anticipative capacity. Despite having lost their home on two previous occasions, the household members relocated and rebuilt the house on the coastline. They did not anticipate being affected again. *“When it first came and we moved forward, we never expected it to come again. Because where we moved then was far higher than the sea. So, we least expected it to be able to come and affect us again. And even when we moved the third time, we did not expect it to come again. If we were able to know that it would affect us like that we would have moved to this side earlier and build ahead. [...] So the first and the second resettlement cost us, they were very costly. So we ran out of funds and that is why we are currently unable to do anything at the place where we are now”* (Interview, 3 August, 2022).

The remaining eighteen households demonstrated no discernible anticipation. Although they had not previously been affected by coastal flooding, they were aware of the

flooding as a natural hazard. However, they did not take any measures to prepare for the possibility of being affected by a flood themselves. One interviewee stated that: *“The sea started destroying things from Blekusu coming. And that time we thought we were safe. Because we had a distance from the sea”* (Interview, 29 July, 2022). The aforementioned quotation serves to illustrate the extent to which households are unaware of the actual risks of being affected by flooding. In addition to misjudging the situation themselves, other households have reported that they have relied on the information provided by other households, which has led them to believe that their house would be safe due to its proximity to the road or due to the existing sea defence. *“Since we were living closer to the roadside, we were told it would not destroy our place. It stops [after] the first houses. We were told it no longer comes close to the road. So we were relieved, only for us being the next victims.”* (Interview, 29 July, 2022).

In conclusion, the studied households demonstrated a lack of capacity to anticipate due to various factors, including disinformation, ousting, low risk awareness, and socio-economic reasons. This section has demonstrated how the complete absence of households' risk awareness towards tidal flooding has even exacerbated their situation. It can be concluded that the absence of anticipation capacity results in a complete absence of preparation and contingency plans in the event of a flood, thereby exposing those at risk to a high degree of vulnerability.

5.2 Capacities to cope and recover

This section presents the capacities to cope and to recover. The coping and recovery strategies employed by the participants could be categorized into two main groups: (1) strategies involving retreat and relocation, and (2) strategies designed to compensate for and recover from the loss of income. As the majority of households were still in the process of recovery during the interviews, their coping and recovery strategies were inextricably linked. Firstly, the process of retreat and relocation is described. Secondly, strategies to compensate for and recover from losses in income are discussed.

5.2.1 Retreat & relocation

In the aftermath of the flood, the majority of participants relocated their personal belongings to a safe location, typically the side of the road or the homes of individuals within their social network. Furthermore, they attempted to remove the roofing sheets and salvage as many concrete bricks as possible. These materials could be used in the construction of a new home. All participants relocated within a period of three months to an area behind a small body of water (indicated in Figure 3), which is replenished during the rainy season with rainfall and water from a nearby lagoon. Three types of intermediate action can be distinguished:

(1) Eight households relocated within a short span of time. Two of those relocated into existing houses, while the others slept in the open until they had constructed a new house.

(2) Seven households sought accommodation with relatives or neighbours within and outside the village for up to three months. During this period, these households were able to construct a new house, including the purchase of new plots if necessary. In almost all cases, participants indicated that the lack of privacy during the period of living with other households led them to attempt to move out as soon as possible. The availability of shelter with neighbours or relatives constituted a crucial coping capacity, which allowed the households to build a new home, thus facilitating the recovery in terms of housing and avoiding additional burden due to sleeping in the open.

(3) Four households reported having to stay either in partially intact parts of their homes and/or in the open air for between two and four weeks.

In total, eight households were forced to sleep in the open for a period of up to one month before they could resettle to an alternative accommodation. This resulted in an increased risk of contracting illnesses such as malaria or being bitten by snakes. Consequently, the lack of access to adequate accommodation served to increase the level of vulnerability.

5.2.2 Reconstruction and living conditions at relocation site

The process of reconstruction and relocation are inextricably linked. While the previous section focused on the process of relocation to the area across the street, this section now presents factors that influence the capacities to build a new house. At the relocation area, three types of houses can be found: (1) permanent buildings that were constructed before the flooding, (2) permanent buildings that were constructed after the flooding, and (3) makeshift shelters mainly made from coconut leaves and salvaged building blocks.

(1) Four households moved into houses built before the flood. Two of these houses were owned by people from the households' social networks. Both buildings were available because the landlords did not live in Agavedzi, but had built these houses for holiday or retirement use. Absentee landlordism is a common phenomenon in Ghana, where successful migrants build houses in their home area that are either unoccupied or rented out for most of the year (Haberger & Jäckel, 2024; van der Geest, 1998). One household moved into a house that had been under construction before the flood in November 2021 (see: 5.1). One household was able to move into a house that had been built on family land before the flood. The shell of the house had been completed before the flood, with the intention of consolidating ownership of the land. However, the two remaining houses were in need of improvement, and the two households were not able to move in immediately.

(2) Six households were able to construct permanent buildings made from cement blocks. Three of these households took loans, accelerating their recovery as they were able to buy the plot of land and the required building materials and/or employ laborers. One of the households also uses instalments to pay for the plot of land. Another household was, at the time of the interview, in the process of building a permanent structure. This household underlines the importance of cooperation between relatives: The two

sons (and their respective families) cooperate and built so far one permanent structure and one incomplete permanent structure as well as a structure from coconut leaves for their mother.

(3) Nine households could not afford to build houses from cement blocks. These households relied on building with salvaged blocks in combination with coconut-tree leaves. Of these households none took a loan with only one paying for the land in monthly rates. Moreover, only two households could employ workers to erect the building. Figure 5 shows one of these makeshift shelters.



Figure 5: Makeshift shelter constructed with coconut leaves and salvaged materials. Source: Own photo with the permission of the residents.

Overall, the differences in the quality of the houses are an expression of how underlying socioeconomic conditions shape the capacity to recover: (i) Only six households mentioned that they were able to employ craftsmen. Of these, four set up a permanent structure. (ii) Loans were not widely used by the participants. In total four households took loans with another one paying for the land in monthly rates. Of these households, five live in permanent structures with one living in a makeshift shelter which seemed to be constructed more robust than the other ones.

Although loans helped to recover quickly in terms of housing, one household reported that the repayment of the loan is very costly and is a financial burden. In contrast, another household, whose primary income stems from salt mining, reported that they are expecting to repay the loan without issues once the salt is collected and sold.

Regarding the quality of the houses, one issue that was frequently raised was that the makeshift shelters did not provide adequate protection during the rainy season. According to one participant, their household lost more personal belongings in the rain in the new shelter than in the flooding that led to their relocation.

One participant explained problems which emerge during the rainy season: *“this place is all mushy area, it gets wet whenever it rains. All this has affected my health recently and I am now recovering”* (Interview, 2 August, 2022).

As a result, the process of relocation and living in temporary structures increased household vulnerability of the majority of households, particularly in the social dimension due to the negative impact on health and well-

being. The living conditions at the relocation area was one of the main reasons for people from different households to consider leaving the village completely, which is discussed in chapter 5.3.

5.2.3 Capacities to cope with loss of income and finding alternative income opportunities

Besides the issue of losing their homes, the participants faced serious challenges in their economic activities.

Regarding the recovery of lost income sources, most households that engage in fishing and/or fish smoking stated that they are either in the process or have the goal to rebuild the necessary equipment. However, financial constraints are an impediment, as the following fisherman states: *“Right now, there is no money. But up to when we have access to enough money to start, we will start”* (Interview, 03 August, 2022). Another participant pointed out that the loss of smoking equipment and missing financial means gives the household a hard time: *“My main occupation, which is the smoking of fish, during the flooding the parts where we make the fire for the smoking, the main thing was taken away. And constructing that thing needs money. Right now, I don't have money to do that which is making life uncomfortable”* (Interview, 29 July, 2022).

We would like to analyse the approach to stabilizing the family budget on the income and expenditure side. From our data, we could distinguish seven different strategies:

- (1) Raising self-sufficiency
- (2) Reducing expenses on basic necessities/amenities
- (3) Removing children from education
- (4) Sending (unproductive) household members away as measures to shift income generation activities
- (6) Working as a daily labourer in the fishing sector
- (7) Sending household members to seek for jobs (work-related migration)

(1) As shown in section 4.3, the majority of households engaged in fishing or smoked/fried fish as part of their livelihood strategies. Consequently, the majority of households had to adapt to changes in their income sources. One strategy employed by individuals to meet their basic needs is to increase their self-sufficiency by fishing for small fish in the nearby lagoon. This allows them to supplement their food demands and lower their cash expenses.

(2) As a result of the aforementioned circumstances, individuals are compelled to curtail their expenditure on essential items or to purchase cheaper products. This has a further negative impact on the local economy, reducing the income of local businesses.

(3) The results of the Mitra|WA Baseline Survey (Wehner et al. forthcoming) indicate that pursuing education is the second most common reason for migration, following the acquisition of employment. In Ghana, education is a highly valuable good, both in terms of the financial capital required to pursue it and the social capital gained through its completion. The removal of children from education or the postponement of their education is a strategy employed by households in order to reduce expenditure. This strategy places children in a precarious situation, as they are deprived of an education which is both financially and socially

valuable. This has a detrimental impact on children and young people of all ages, with some being compelled to leave even primary school. Other students have been unable to commence tertiary education as originally intended. The costs of pursuing higher education, including college and university studies, as well as vocational training in the form of apprenticeships, are considerable. Colleges and universities charge tuition fees. Furthermore, apprenticeships entail additional costs, including those associated with living expenses, the provision of equipment, and fees payable to the apprentice's master. In the context of families struggling to meet their daily survival needs, these expenses are often postponed.

(4) In particular, members of the household who do not contribute to the household income represent a financial burden in times of crisis. In order to reduce expenditure and to have fewer mouths to feed, individual household members are relocated to family and friends. This topic will be addressed in greater detail in the subsequent chapter.

(5) A reduction in business investments is required. Inferior materials are employed in the production of salt. However, as a consequence, there is an expectation that sales revenue will be reduced.

(6) In total, five households implemented short-term adjustments to their income strategies in order to cope with the loss of their primary income sources and to recover these lost assets. Members of these households transitioned from independent craftsmen or fishermen to gain income as daily laborers in the fishing sector, performing tasks such as carrying loads, pulling nets, and fishing on a boat. All respondents expressed optimism regarding the upcoming fishing season, with the hope of replacing their fishing, smoking, or carpentry equipment. This would, depending on the fishing season, take between six months and a year. Although there is evidence of a change in the livelihood strategies of these households, this should not be interpreted as adaptation, as the change is intended for a limited time.

(7) Job migration: Households that are (partially) translocally organized received assistance from members of the household remaining in other locations. Nevertheless, none of these households received higher remittances than before the flooding event. To alleviate the cash shortage, some household members have relocated from their original residence, either temporarily or permanently in order to make a living for themselves and also aiming to remit to their household. This topic will be discussed in greater detail in the subsequent chapter.

To summarize the capacity of households to become economically reinvigorated, it is first necessary to realize the precarious starting position of households before the disaster. We have to take into account that the majority of individuals are already situated within the low-income bracket, with only a narrow margin above the absolute poverty line – if that at all. This leaves little room for reducing expenditure without (temporary) changes to their livelihoods. The capacity of these individuals to cope with the loss of their traditional income sources is limited. The rural economy and the job market in the area are generally weak, and this is further compounded by the current inflation

and economic crisis in Ghana. The inhabitants of the region have limited or no formal education or training, and their livelihoods depend on traditional skills such as fishing or fish processing. Similarly, other income opportunities, including those for unskilled and qualified workers alike, are also scarce. The absence of alternative sources of income renders individuals and household's incapable of coping with and recuperating from the loss of income or income-generating activities easily.

5.3 Migration as an adaptation strategy

5.3.1 Types of migration

Like in other rural parts of Ghana and West Africa, migration is an important aspect of peoples' livelihoods (Steinbrink & Niedenführ 2020). Within the studied households, eight of twenty households already had established translocal ties before the flood event and can be considered as migration households. Half of these households reported that - in the wake of the disaster - more of their members left the village. From the twelve 'non-migrant households', five reported that they used out-migration as a reaction to cope with or adapt to the new situation. In all these cases, the reported migration-activity followed along social (mainly family) networks.

This chapter will examine the various forms of migration, with a view to distinguishing between coping and adaptation strategies. Our data allows us to distinguish between different types of migration strategies in terms of motivation and duration.

a) Migration as a coping mechanism to lower subsistence pressure

Migration was a primary response measure implemented to alleviate the burden on households to fulfil the basic needs of their members during periods of economic crisis. In particular, this concerns the security of housing and food. Following the loss of their homes and the family's relocation to relatives' or emergency shelters, family members who do not contribute to the household income are encouraged to migrate. Most of these individuals are accommodated with the extended family, within the Volta region and beyond. This particularly applies to children and elderly people. For example, one family was unable to accommodate their grandmother due to the limited space in their temporary accommodation. Consequently, the grandmother was obliged to relocate to another branch of the family in a different village. In other cases, children are sent to family members. This serves to illustrate the significance of social cohesion among Ghanaian families. In the event of an emergency, the financial responsibility for supporting family members who are unable to provide for themselves is shared among the extended family.

b) Migration to relocate economic activities

Prior to the flood, 40% of households had diversified their income sources through receiving remittances. As a response to the flood event, a number of younger adults employed the strategy of out-migration of adults of working age in order to pursue livelihoods elsewhere. However, none

of the adults who relocated to pursue employment elsewhere were able to remit regularly. The majority of these individuals remain in a state of precariousness, merely able to meet their own basic needs while residing with relatives. As is the case with many migrants who lack formal education and job training, throughout Ghana, they are employed in the informal sector, where wages are low. The income generated is insufficient to cover the costs of living. Only few of the younger family members were able to remit cash or food on an occasional basis to support their younger siblings and parents. The case of a young man who ventured to the Western Region in search of gold exemplifies the challenges faced by internal migrants in rapidly establishing a profitable economic base. Some investment was required, and before he was able to remit funds, he needed to repay the costs of purchasing mining equipment. This was not yet the case at the time of the interview.

c) Permanent migration

A single family has indicated their intention to relocate entirely to a location situated at a greater distance from the coast. Prior to the flood event, the intention was for one daughter to pursue an apprenticeship in Agavadzi. Following the flood, this daughter was sent to reside with her uncles in order to pursue an apprenticeship in her mother's hometown. Once the daughter has settled, the remainder of the family will also resettle, relocating to the mother's birthplace with the support of the extended family.

In total, nine individuals, particularly those who were unable to afford to construct a suitable long-term residence, have indicated their intention to relocate permanently due to the substandard housing and environmental conditions in the new site. Table 2 gives an overview of the reasons and destinations of the total 13 long-term migrants in the study group.

<i>Main reason for migration (multiple)</i>	<i>Accommodation situation</i>	9
	<i>Apprenticeship</i>	4
	<i>Other work</i>	5
<i>Destination</i>	<i>Relatives</i>	7
	<i>Other social contacts</i>	2
	<i>Outside social network</i>	1
	<i>Unknown</i>	2

Table 2: Reasons and destination for migration based on own data

5.3.2 Capacities and vulnerabilities related to migration:

Migration serves to enhance the capacities of households to cope and adapt in a variety of forms and intensities. With regard to vulnerability, it is important to note that the vulnerability of households is reduced when the burden of providing for non-working age members is shared. In the context of familial ties, the affected household is expected to provide for all members. Consequently, there is greater potential for financial recovery, with the capacity to invest in essentials such as equipment and reconstruction of the house, and to reduce expenditure on non-essential items. Migrants of working age who leave their families to fend for themselves also relieve the burden of feeding all household members. There is a possibility or expectation that these migrants of working age will remit money at some point.

However, the vulnerability of individual household members is increased, particularly those young people who remain in distant locations with relatives or acquaintances. The topic of child migration and child labour in Ghana is discussed, with particular focus on the potentially exploitative nature of these practices. While the practice of sending children and young people away to be taken into foster care by relatives and friends is a common and accepted one, it leaves children and young people vulnerable (Kuyini et al. 2009). To illustrate, one girl who was sent to another town to assist in the family business of a former classmate, is a case in point. She receives free lodging and some food, but no salary. In return, the proprietor of the shop promised to support her further education in the future. The family in Agevadzi is still responsible for providing her with food and other essentials for her upkeep. It is not guaranteed that the host will honour their commitment to provide financial support for the girl's future education in exchange for her current unpaid labour.

Conclusively, we see that migration is one of many strategies to cope with crisis and adapt to the new circumstances. We see that this strategy is selected more often by those households who already have some experience. On the other hand, we also see that migration follows along social networks, is heavily reliable on social capital and also can increase the vulnerability of the individual migrants, which have to leave the family and home often at an early age.

6. Conclusion

This case study, situated within the context of climate change and migration, examined the vulnerability and capacities of 20 households affected by coastal flooding in the Volta Region of Ghana.

One focal point of this paper is the analysis of qualitative data concerning the vulnerabilities of affected households. With reference to the key dimensions of exposure, susceptibility and capacities (Birkmann et al., 2013), the analysis identified various elements of vulnerability experienced by households in an impoverished fishing community and examined their capacities to anticipate, cope with, and recover from flooding. The study revealed that households face multi-dimensional vulnerabilities due to flooding, encompassing environmental, socio-economic, and cultural aspects. Despite previous flood events and awareness-raising efforts, the capacity for anticipation was found to be very low. Given the already strained economic situation of fishing-based households in Ghana, their capacity for recovery and adaptation was also significantly limited.

Moreover, the study highlighted challenges arising from low capacities, including health risks associated with inadequate housing conditions in relocation areas. Through the lens of poverty, the study demonstrated that households in one of Ghana's poorest regions experienced not only an increase in monetary poverty but also multidimensional poverty, affecting housing, health, nutrition, and education, among other areas (Ewusi, 2020).

Another focal point of the paper is the study of migration as a coping or adaptation strategy. Our data reveal that migration in response to the disaster varies in intention, intensity, and timescale. It becomes evident that there is no direct link between natural disasters and migration as a coping or adaptation strategy. Migration is merely one mechanism consistent with pre-existing cultural and socio-economic patterns and structures. Although the flooding led to some out-migration, the study shows that most affected people do not plan to migrate. On the contrary, it was found that households aim to remain in Agavedzi long-term. Migration, while not uncommon, is not the primary response to the flooding. Additionally, no households completely abandoned their homes; instead, they sent some members on migration journeys, following existing social networks. This finding aligns with previous research. Codjoe et al. (2017) found that coastal flooding exposure is not a major cause of out-migration in Volta Delta communities. Hillmann and Ziegelmayer (2016) showed that flooding in Keta is not a primary reason for out-migration and that migration following flooding is influenced by various factors beyond the flood's impact. Further, our results acknowledge recent studies that qualify the alarmist and one-dimensional scenarios of climate change-related mass migration in and beyond the Ghanaian setting (Pantaleon, 2024; Schraven, 2023; Ungruhe et al., 2023). In sum, coastal flooding and erosion will become even more increasingly significant in the future, especially in Global South settings like coastal Ghana, where adaption capacities are still very low. Therefore, the insights from this paper provide a valuable starting point for not only adequate policy responses to flooding but also for further research into the long-term impacts of coastal flooding.

Acknowledgments

Foremost, we want to express our deep gratitude to the people of Agavedzi for their willingness to participate in this study and to Raymond Buckner for his translation services and his time and efforts during data collection. Second, Tobias is thankful for the academic support he received from Malte Steinbrink, Christian Ungruhe, Stefanie Wehner and John Narh who made the field research possible and supported him continuously during the research process.

References

- Addo, K. A., Jayson-Quashigah, P. N., & Kufogbe, K. S. (2012). Quantitative analysis of shoreline change using medium resolution satellite imagery in Keta, Ghana. *Marine Science*, *1*(1), 1–9. <https://doi.org/10.5923/j.ms.20110101.01>
- Alves, B., Angnuureng, D. B., Morand, P., & Almar, R. (2020). A review on coastal erosion and flooding risks and best management practices in West Africa. What has been done and should be done. *Journal of Coastal Conservation*, *24*(3). <https://doi.org/10.1007/s11852-020-00755-7>
- Aman, A., Tano, R. A., Toualy, E., Silué, F., Addo, K. A., & Folorunsho, R. (2019). Physical forcing induced coastal vulnerability along the Gulf of Guinea. *Journal of Environmental Protection*, *10*(09), 1194–1211. <https://doi.org/10.4236/jep.2019.109071>
- Azevedo, V., Carvalho, M., Costa, F., Mesquita, S., Soares, J., Teixeira, F., & Maia, Â. (2017). Interview transcription: Conceptual issues, practical guidelines, and challenges. *Revista de Enfermagem Referência*, *4*(14), 159–168. <https://doi.org/10.12707/RIV17018>
- Babanawo, D., Mattah, P. A. D., Agblorti, S. K. M., Brempong, E. K., Mattah, M. M., & Aheto, D. W. (2022). Local indicator-based flood vulnerability indices and predictors of relocation in the Ketu South Municipal Area of Ghana. *Sustainability*, *14*(9). <https://doi.org/10.3390/su14095698>
- Bernard, H. R. (2002). *Research methods in anthropology: Qualitative and quantitative approaches* (4th ed.). Altamira Press.
- Birkmann, J. (2011). Regulation and coupling of society and nature in the context of natural hazards. In H. G. Brauch, Ú. Oswald Spring, C. Mesjasz, J. Grin, P. Kameri-Mbote, B. Chourou, P. Dunai, & J. Birkmann (Eds.), *Coping with global environmental change, disasters and security: Threats, challenges, vulnerabilities and risks* (pp. 1103–1128). Springer, Berghof Foundation.
- Birkmann, J., Cardona, O. D., Carreño, M. L., Barbat, A. H., Pelling, M., Schneiderbauer, S., Kienberger, S., Keiler, M., Alexander, D., Zeil, P., & Welle, T. (2013). Framing vulnerability, risk and societal responses. The MOVE framework. *Natural Hazards*, *67*(2), 193–211. <https://doi.org/10.1007/s11069-013-0558-5>
- Boateng, I. (2012a). An application of GIS and coastal geomorphology for large scale assessment of coastal erosion and management: A case study of Ghana. *Journal of Coastal Conservation*, *16*, 383–397. <https://doi.org/10.1007/s11852-012-0209-0>
- Boateng, I. (2012b). An assessment of the physical impacts of sea-level rise and coastal adaptation: A case study of the eastern coast of Ghana. *Climatic Change*, *114*(2), 273–293. <https://doi.org/10.1007/s10584-011-0394-0>
- Brinkhoff, T. (2021). Ketu South Municipal. In *citypopulation.de*. Last change: 15.04.2022. https://www.citypopulation.de/en/ghana/admin/volta/04_03_ketu_south_municipal/ [last access: 05.05.2024]
- Chambers, R., & Conway, G. (1991). Sustainable livelihoods: Practical concepts for the 21st century. *IDS Discussion Paper 296*. Institute of Development Studies.
- Clement, V., Rigaud, K. K., de Sherbin, A., Jones, B., Adamo, S., Schewe, J., Sadiq, N., & Shabahat, E. (2021). *Groundswell part 2: Acting on internal climate migration*. World Bank.

- Codjoe, S. N. A., Nyamedor, F. H., Sward, J., & Dovie, D. B. (2017). Environmental hazard and migration intentions in a coastal area in Ghana: A case of sea flooding. *Population and Environment*, 39(2), 128–146. <https://doi.org/10.1007/s11111-017-0284-0>
- Dada, O. A., Almar, R., & Oladapo, M. I. (2020). Recent coastal sea-level variations and flooding events in the Nigerian transgressive mud coast of Gulf of Guinea. *Journal of African Earth Sciences*, 161. <https://doi.org/10.1016/j.jafrearsci.2019.103668>
- DFID. (1999). *Sustainable livelihood guidance sheets*. Department for International Development.
- Ewusie, E.-A. (Ed.). (2020). *Multidimensional Poverty-Ghana*. Ghana Statistical Service. https://statsghana.gov.gh/gssmain/fileUpload/pressrelease/Multidimensional%20Poverty%20Ghana_Report.pdf [last access: 03.06.2024]
- Ghana Statistical Service. (2014). *2010 Population & housing census: District analytical report: Ketu South Municipality*. Online available: https://www2.statsghana.gov.gh/docfiles/2010_District_Report/Volta/Ketu%20South.pdf. [Last access : 27.05.2024]
- Giardino, A., Schrijvershof, R., Nederhoff, C. M., De Vroeg, H., Brière, C., Tonnon, P.-K., Caires, S., Walstra, D. J., Sosa, J., Van Verseveld, W., Schellekens, J., & Sloff, C. J. (2018). A quantitative assessment of human interventions and climate change on the West African sediment budget. *Ocean & Coastal Management*, 156, 249–265. <https://doi.org/10.1016/j.ocecoaman.2017.11.008>
- Google & Airbus/CNES. (2022). Aerial picture. <https://earth.google.com/web/@6.00857217,1.04762606,7.23224982a,1647.5351495d,30y,301.84973566h,0t,0r>. [Last access: July 19, 2023]
- Haberger & Jäckel (2024): The Stone-Made Myth of Return: Translocality and Housing in Amedzofe –. In: Ungruhe, C., & Wehner, S. (eds.), *Migration, translocality and development in times of climate change*. Mitra|WA Working Paper Series Volume 3.
- Hillmann, F., Okine, R. K., & Borri, G. (2020). Because migration begins from the villages: Environmental change within the narrations of the Ewe diaspora. *Ethnic and Racial Studies*, 43(16), 39–56. <https://doi.org/10.1080/01419870.2019.1667002>
- Hillmann, F., & Ziegelmayr, U. (2016). Environmental change and migration in coastal regions: Examples from Ghana and Indonesia (2nd ed.). *Gesellschaft für Erdkunde zu Berlin*.
- Jamshed, A., Birkmann, J., Feldmeyer, D., & Rana, I. A. (2020). A conceptual framework to understand the dynamics of rural–urban linkages for rural flood vulnerability. *Sustainability*, 12(7), 2894. <https://doi.org/10.3390/su12072894>
- Jordan, E., & Javernick-Will, A. (2013). Indicators of community recovery. Content analysis and delphi approach. *Natural Hazards Review*, 14, 21–28. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000087](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000087)
- Ketu South Municipal Assembly. (2023). About Ketu South. www.ketusouth.gov.gh. [Last access: 26.05.2024]
- Kirezci, E., Young, I. R., Ranasinghe, R., Lincke, D., & Hinkel, J. (2023). Global-scale analysis of socioeconomic impacts of coastal flooding over the 21st century. *Frontiers in Marine Science*, 9. <https://doi.org/10.3389/fmars.2022.1024111>
- Kirezci, E., Young, I. R., Ranasinghe, R., Muis, S., Nicholls, R. J., Lincke, D., & Hinkel, J. (2020). Projections of global-scale extreme sea levels and resulting episodic coastal flooding over the 21st Century. *Scientific Reports*, 10. <https://doi.org/10.1038/s41598-020-67736-6>
- Kuyini, A. B., Alhassan, A., Tollerud, I., Weld, H., & Haruna, I. (2009). Traditional kinship foster care in northern Ghana: The experiences and views of children, carers and adults in Tamale. *Child & Family Social Work*, 14(4), 440. <https://doi.org/10.1111/j.1365-2206.2009.00616.x>
- Kraan, M. (2011). More than income alone: The Anlo-Ewe beach seine fishery in Ghana. In S. Jentoft & A. Eide (Eds.), *Poverty Mosaics: Realities and Prospects in Small-Scale Fisheries* (pp. 147–172). Springer Netherlands. https://doi.org/10.1007/978-94-007-1582-0_8
- Laïbi, R. A., Anthony, E. J., Almar, R., Castelle, B., Senechal, N., & Kestenare, E. (2014). Longshore drift cell development on the human-impacted Bight of Benin sand barrier coast, West Africa. *Journal of Coastal Research*, 70, 78–83. <https://doi.org/10.2112/SI70-014.1>
- Ly, C. K. (1980). The role of the Akosombo Dam on the Volta river in causing coastal erosion in central and eastern Ghana (West Africa). *Marine Geology*, 37(3–4), 323–332. [https://doi.org/10.1016/0025-3227\(80\)90108-5](https://doi.org/10.1016/0025-3227(80)90108-5)
- Mayring, P. (2015). *Qualitative Inhaltsanalyse. Grundlagen und Techniken* (12th ed.). Beltz.
- Mensah, C., Kabo-bah, A. T., & Mortey, E. (2017). Assessing the effects of climate change on sea level rise along the Gulf of Guinea. *Journal of Energy and Natural Resource Management*, 4(1), 15–22. Available online: <https://jenrm.uenr.edu.gh/index.php/uenrjournal/article/view/98/54> [Last access: 31.05.2024]
- Mensah, J. V., & Antwi, B. K. (2002). Problems of artisanal marine fishermen in Ghana: The way ahead. *Singapore Journal of Tropical Geography*, 23(3), 217–235. <https://doi.org/10.1111/1467-9493.00126>
- Ministry of the Interior. (2023). National Disaster Management Organization. www.mint.gov.gh

- <https://www.mint.gov.gh/agencies/national-disaster-management-organization/>. [Last access: 26.05.2024]
- Nicholls, R. J., & Cazenave, A. (2010). Sea-level rise and its impact on coastal zones. *Science*, 328(5985), 1517–1520. <https://doi.org/10.1126/science.1185782>
- Ofori, F. N. K. (2021). The Socio-economic Challenges and Opportunities of Ghana's Coastal Communities: The Cases of Ada and Keta. <https://doi.org/10.1080/13673882.2021.00001101>
- Osisiadan, P. (2021). Keta coastal flooding: Is it a warning for Ghana about climate change? *Myjoyonline.com*. <https://www.myjoyonline.com/keta-coastal-flooding-is-it-a-warning-for-ghana-about-climate-change/> [Last accessed: 26.05.2024]
- Pantaleon, A. (2024). Climate Migration as a driver of migration? A comparative case study in eastern and northern Ghana. In: Ungruhe, C., & Wehner, S. (eds.), Migration, translocality and development in times of climate change. Mitra|WA Working Paper Series Volume 1.
- Pinsky, V. C., Kruglianskas, I., Gomes, C. M., & Rezaee, A. (2019). Sustainability research: A grounded theory approach in the field of climate change. *Revista de Gestao Ambiental e Sustentabilidade*, 8(3), 468–488. <https://doi.org/10.5585/GEAS.V8I3.15766>
- Schraven, B. (2023). “Klimamigration“. Wie die globale Erwärmung Flucht und Migration verursacht. Transcript.
- Smith, G.P., & Wenger, D. (2007). Sustainable Disaster Recovery: Operationalizing An Existing Agenda. In: Rodríguez, H., Quarantelli, E. L., & Dynes, R. R. (Eds.): *Handbook of Disaster Research* (pp. 234-257). Springer.
- Steinbrink, M., & Niedenführ, H. (2020). *Africa on the move: Migration, translocal livelihoods and rural development in Sub-Saharan Africa*. Springer International Publishing. <https://doi.org/10.1007/978-3-030-22841-5>
- Strauss, A. L., & Corbin, J. (1990). Grounded theory research: Procedures, canons and evaluative criteria. *Zeitschrift für Soziologie*, 19(6), 418–427. JSTOR:23845562
- Tenbrink, T., & Willcock, S. (2023). Place attachment and perception of climate change as a threat in rural and urban areas. *PLOS ONE*, 18(9), e0290354. <https://doi.org/10.1371/journal.pone.0290354>
- Thurairajah, K. (2019). Uncloaking the researcher: Boundaries in qualitative research. *Qualitative Sociology Review*, 15(1), 132–147. <https://doi.org/10.18778/1733-8077.15.1.06>
- UNDDRR. (n.d.). Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction. A/71/644.
- Ungruhe, C., Steinbrink, M., & Teye, J. (2023). Mobiles Westafrika. Kontinuitäten und Dynamiken von Migration in Zeiten klimatischer Veränderungen. *Geographische Rundschau*, 75(10), 30–35.
- Van der Geest, S. (1998): Yebisa Wo Fie: Growing old and building a house in the Akan Culture of Ghana. *Journal of Cross-Cultural Gerontology* 13(4), 333–359.
- Wehner, S., Steinbrink, M., Narh, J., & Ungruhe, C. (2024) (forthcoming). Migration and Translocality in West Africa (MiTtra|WA). Empirical data from the multi-local survey on migration and translocal structures in Burkina Faso, Ghana, Nigeria and Sierra Leone. Part I/VI: Ghana: Northern Region, Eastern Region, Greater Accra Region. GFZ Data Services.
- White, G.F. (1945) *Human Adjustment to Floods. A Geographical Approach to the Flood Problem in the United States*. In: Chicago, T.U.O., Ed., Research Paper No. 29, The University of Chicago, Chicago.
- World Bank. (2023). Ghana: Distribution of employment by economic sector from 2011 to 2021 [Graph]. In Statista. Retrieved March 01, 2024, from <https://www.statista.com/statistics/447530/employment-by-economic-sector-in-ghana/>
- Yaro, J. A. (2010). The social dimensions of adaptation to climate change in Ghana. Discussion Paper Number 15, The World Bank. Available online: <https://documents1.worldbank.org/curated/en/513441468326170992/pdf/589020NWP0EACC10Box353823B01public1.pdf>. [Last access: 26.05.2024]

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Publication Details

Cite as:

Klöpf, T. & Wehner, S. (2024). Vulnerabilities and capacities: Dealing with coastal flooding in Ghana’s Volta Region. In: Ungruhe, C., & Wehner, S. (eds.), Migration, translocality and development in times of climate change. Mitra|WA Working Paper Series No 2.

DOI: 10.15475/mitrawa.upa2

Publication Date: July 15th 2024

Editors: Ungruhe Christian, Wehner Stefanie

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www.uni-passau.de/en/mitrawa