

## Environmental hazard and migration intentions in a coastal area in Ghana: a case of sea flooding

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**Abstract** Recently, there has been significant debate about whether ‘environmental migration’ can constitute a form of adaptation to environmental change, as opposed to forced or flight migration. The Foresight Report on Migration and Environmental Change (2011) suggested environmental factors are one driver of migration, as well as political, social, economic and demographic drivers, and that—under the right conditions—migration can be a form of adaptation to changing climatic conditions. However, this is dependent on migrants having adequate social and financial capital to undertake beneficial types of migration; it further argues that environmental change may result in ‘trapped populations’ whereby people who lack the necessary resources to re-establish livelihoods elsewhere may be left exposed to increasingly severe environmental shocks and stresses in situ. Research on the climate-migration nexus in West Africa has largely focused on out-migration from the semi-arid Sahel with more limited evidence about how sea flooding interacts with migration flows. This paper attempts to help fill this knowledge gap. Using data from a representative survey of households across three coastal communities in Ghana’s Volta River Delta, this paper concludes that exposure to sea flooding may not be a primary cause of out-migration as other community, economic and political factors influence migration intentions and decisions. Thus, it is important for planned adaptation interventions to be strengthened in situ to enable households, particularly farming households, sustain their livelihoods.

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## Introduction

This paper investigates the relationship between migration and environmental change in the particular context of Ghana's Volta River Delta by considering the relationship between coastal flooding and migration intentions in three coastal communities. As Black et al. (2008) have noted, sea flooding is one of the significant climate change impacts expected to affect Ghana in the coming decades, due to factors such as sea level rise and coastal erosion. As Boateng (2012) has shown, the impacts of sea flooding—and the associated phenomenon of sea-level rise—are highly significant in this section of Ghana's coast, and the unmitigated impact of sea flooding in the Volta River Delta could ultimately impact an area that is currently home to about 800,000 people. However, although sea flooding from the delta may be a recent phenomenon, studies of migration of people from the delta, especially Keta and other areas of the Volta Region, as well as flooding of communities as a result of the construction of the Akosombo Dam to the Accra metropolitan region, date back decades (Tsikata, 2006). This paper seeks to establish whether there is a clear relationship between sea flooding as experienced by local residents and their migration intentions. Through conducting a representative survey of households across three coastal communities, the paper also explores whether there is a relationship between migration intentions and particular migrant characteristics, including age, occupation and gender.

In doing so, the paper seeks to contribute to the ongoing debate on the 'migration-climate nexus' by helping to establish how environmental change in coastal Ghana is likely to interact with migration trends in future years. In recent years, there has been significant debate about whether 'environmental migration' (see Dun and Gemenne 2008 on the contested definitions of this term) in the developing world can constitute a form of adaptation to environmental change, as opposed to a form of forced or flight migration (see for example: Afifi et al. 2016; McLeman and Smit, 2006; and McLeman and Hunter 2010). In this vein, the Foresight Report on Migration and Global Environmental Change (Foresight 2011) suggested that environmental factors are one driver of migration, as well as political, social, economic and demographic factors, and that—under the right conditions—migration can be a form of adaptation to changing climatic conditions. However, the report cautions that this is dependent on migrants having adequate social and financial capital in order to undertake beneficial types of migration; it further argues that in some cases, environmental change may result in 'trapped populations' whereby people who lack the necessary resources to re-establish livelihoods elsewhere may be left exposed to increasingly severe environmental shocks and stresses in situ.

## Conceptualising environmental changes and migration intentions

Migration intentions are used as a proxy for actual migration in this study because of their significance in the internal migration literature and extensive use in several fields (Agadjanian et al., 2008; Becerra and Gurrola 2010; Ivlevs and King 2012; Epstein and

Gang 2006; Mendoza et al. 2013; Abu et al. 2014). The major advantage of using migration intentions is that it allows for follow-up surveys to ascertain whether migration intentions translated into actual migration. It has been argued that intentions are considered as the first steps before the actual migration takes place (Macleod 1996; Van Dalen and Henkens 2008), and in most instances, intentions have culminated into actual migration (De Jong 2000).

Several authors have elaborated the ways in which environmental change (including both sudden- and slow-onset change) is relevant to research on migration intentions (Gemenne et al. 2014; Li et al. 2014; Zickgraf et al. 2016). In sudden-onset changes, where the changes are abrupt and often significant such that there is no opportunity to plan towards the future, there is a more tenuous link to migration intentions. By contrast, slow-onset change such as land degradation and biodiversity loss is often difficult to detect, gradual and takes time to manifest thus, the effects are not immediately felt (Li et al. 2014; Zickgraf et al. 2016). Such gradual changes are more likely to inform migration intentions. Therefore, the intention of a population to migrate will not only be determined by the type of process of change but also how the population has interacted with the proximate drivers and the underlying causes prior to the change itself (Zickgraf et al. 2016). Li et al. (2014) added another dimension of intentions to migrate by examining whether or not people plan to move because they have actually experienced an environment change or climatic change, or it is about the perception of change in the environmental problem.

Despite the advantages of the use of migration intentions enumerated above, the concept has been criticised for lacking credibility. Others have stated that intentions per se do not necessarily enable an individual to leave the social, economic and to some extent the political context. In other words, potential migrants should not only have the intention but also the capacity or capabilities (Sen 1985), including networks to make the intention a reality (de Haas 2010; Hillmann and Ziegelmaye 2016). Thus, it is the capability for migration which is a necessary condition for potential migration and not the intention in itself (Pismennaya et al. 2015). It has also been shown that there is a disadvantage of emphasising environmental problems as a major concept for mobility and intent to migrate due to the fact that there is no threshold or limitations on which a population can establish intent to migrate, similarly proposed in the past for environmental refugees (Morrissey 2012). For example, in Malawi, it has been argued that environmental problems seek to reduce the intent of migration as vulnerable people strive to protect the origin of their livelihoods (Suckall et al. 2015).

Furthermore, critiques also allude to using environmental changes as basis to inform intents to migrate. In their view, it is naturally nested within the already established networks for migration and therefore can only be opportunistic. In addition, it has been argued that a migrant should not be defined in accordance with changing a place of residence due to changes in mean annual temperature and decreases or increases in the norms of annual precipitation unless there are threats to human life (Pismennaya et al. 2015). Finally, the use of perceptions in environmental change as opposed to actual experiences to inform migration intention has also been criticised. This is because, such perceptions may raise hopes and confidence of change and thus the academic literature has not very well interrogated or clearly distinguished between whether or not peoples' intention to migrate depended on actual occurrence or perception.

Some studies have demonstrated that intentions are good predictors of actual migration (Constant and Massey 2002; Sutton 1998). Deducing from the ‘new economics of labour migration’ thesis (Lauby and Stark 1988; Stark 1991), migration decisions of households under environmentally challenged conditions will be based not only on the benefits that households will accrue from migration but also the level at which risk associated with environment-related events will be minimised.

Finally, Carling (2002) makes a distinction between people’s aspiration to migrate and the actual ability to engage in migration. In the migration sending area, there is a category who intends to migrate and they have the conviction that migration may be preferred to the opposite scenario, i.e. non-migration. In this category, there will be a number of them who will have the ability to migrate and whose movements can be visible and observable and they are considered as *migrants*. However, the second category are the ones who have aspirations to migrate but may be unable to do so due to a host of factors including gender, age, family migration history, social status, educational attainment and personality traits, and they are referred to as *involuntary non-migrants*. Finally, a third category is recognised by Carling (2002). These are those who choose to stay because of a conviction that non-migration is preferable to migration, and they are referred to as *voluntary non-migrants*.

### **Wider context: migration and climate change—the case of sea flooding**

Much of the research on the climate-migration nexus in West Africa initially focused on out-migration from the semi-arid Sahel, especially with regard to migratory responses to severe drought in the 1970s and 1980s (Morrissey 2014). However, the existing research on the relationship between migration and environmental change in West Africa—though it lacks a focus on deltas—does suggest that the relationship between human mobility and environmental events is non-linear. Morrissey (2014: p. 91) observes that

...it is clear from empirical accounts that migration is generally an established livelihood strategy that (a) has been shaped by historical processes such as colonial taxes, the slave trade and forced labour schemes (de Haan et al. 2002; Afifi 2011; Doevenspeck 2011) and (b) constitutes a long-standing response to environmental stress in West Africa (van Apeldoorn 1981; Mortimore 1989; Hampshire 2002).

As Morrissey (2014) points out, the existing evidence across the region suggests that migration can be usefully thought of as one of a portfolio of societal responses to environmental change and variability across the region and one which is mediated by socio-economic factors of would-be migrants. In Burkina Faso, for example, Henry et al. (2004a) showed that fewer people migrated out of areas with unfavourable climatic conditions when compared to those with favourable ones, because households located in the former were less likely to have the capital necessary for initial migration costs. In a different study, Henry et al. (2004b) looked at the impact of rainfall stress, land availability and road access on migration decisions in Burkina Faso. Here, individual factors (including education level, ethnic group membership, livelihood type

and gender) were found to be much more significant than poor rainfall in determining people's mobility decisions and also impacted the destination of people's migration.

Research on the 'climate-migration nexus' in Ghana has often focused on out-migration from Northern Ghana, which is a sub-region characterised by a long-running culture of out-migration and relatively marginal environmental conditions in terms of rainfall and soil quality in comparison to the rest of the country. For example, van der Geest et al. (2010) have shown that migration from Northern Ghana to Western and Central Ghana that is evident in the 2000 Ghana Population and Housing Census is linked to lower population densities and higher vegetation rates at migration destinations. Sward (2016) looks at how migration from Northern Ghana to Brong Ahafo Region's transition zone in central Ghana, which has been a significant secondary migration flow since the 1970s, has been driven by the relative abundance of farmland in Brong Ahafo in comparison to the north, and better agro-ecological conditions, including two rainy seasons per calendar year. Rademacher-Schulz et al. (2014) present recent household data that shows that in the case of Ghana's Upper West Region, out-migration is increasingly happening during the agricultural season, with villagers increasingly pursuing small-scale gold mining, or *galamsey*. Meanwhile, Sow et al. (2012) have shown that in the case of out-migration from Upper East Region, environmental factors influencing migration intersect with migration increasingly being viewed as a means to achieve material aspirations linked to ethnic-based definitions of social mobility, and Bawakyillenuo et al. (2014) found that seasonal migration is just one livelihood response among many to climate variability in Northern Ghana's savannah zone.

In terms of the existing research on sea flooding and migration in West Africa, Zickgraf et al. (2016: p. 4) observed in a cross-regional analysis of the 'climate-migration nexus in West Africa that environmental factors influence mobility into and out of the region in multiple ways from the Sahel to the coast, with different communities and individuals' capacity to adapt to climatic changes and shocks being unequally distributed. It has been revealed that in West Africa, 40% of the population lives in coastal cities, and it is expected that the 500 km of coastline between Accra and the Niger Delta will be populated by more than 50 million people in megacities by 2020. Port cities in the region (including Lagos, Abidjan, Lomé, Conakry, Dakar and Accra) are severely exposed to sea level rise, which could also cause soil salinisation, affecting agricultural productivity and food security. Zickgraf et al. (2016) further consider two case studies related to sea flooding, in particular: Saint-Louis, Senegal, and Cotonou, Benin, which have both experienced significant sea flooding and coastal erosion in recent decades. They show that in Saint-Louis, Senegal, international out-migration was mainly practiced by young men, who often migrated across Senegal's northern border to urban areas in Mauritania, while some successful fisherman were able to relocate to other parts of the Senegalese coast (Zickgraf et al. 2016, p. 11). Meanwhile, in Cotonou, Benin, which experienced 400 m of coastal erosion between 1963 and 1997, those with adequate social and economic capital typically pursued out-migration with only fishermen and those with insufficient capital to migrate typically remaining, in the latter case creating the prospect of 'trapped' populations (Zickgraf et al. 2016, pp. 15–17). Additionally, Black et al. (2008) argue that in the case of Ghana, rural-urban migration trends to Accra and other coastal cities

could be affected by coastal flooding in the coming decades, as settlements, including informal settlements are often inhabited by migrants (Rain et al., 2011; Getis, 2015).

Additionally, there has been some research conducted on the links between coastal flooding and migration in other regions in the Global South. For example, the links between coastal flooding and migration/displacement (exacerbated by factors such as sea level rise and increased storm severity) have been the focus of much research and policy in island nations, such as Small Island States in the Pacific, where some populations risk eventual displacement (Boncour and Burson, 2009; Wetzel et al. 2012; Wyett 2014; Campbell, 2014; Kelman, 2015), and the Caribbean, where rising seas and coastal flooding threaten much of the region's existing infrastructure (see Sward 2012 for an overview). In Bangladesh, a recent research has shown that a 2009 sea flooding incident has contributed to an increase in seasonal migration in subsequent years, leading to the erosion of local livelihoods (especially in aquaculture) (Martin et al. 2014, p. 99). Cyclone Aila and the storm surge it caused led to sudden displacement of local villagers in 2009, and the storm's destruction of some villagers' farming infrastructure has made migration more common in the subsequent years (Martin et al. 2014, p. 99). As the authors note, while the main motivations for migration were often economic, in effect migration was also a form of adaptation to environmental change (Martin et al. 2014), illustrating the often complex overlap between environmental and other drivers of migration.

## Study area

The Dangbe East district with a population of 130,795 in 2010 (GSS 2012) is situated in the eastern part of the Greater Accra Region (Fig. 1). It is located between latitudes 5° 45' S and 6° 00' N and Longitude 0° 20' W and 0° 35' E. The total land area of the district is about 909 km<sup>2</sup>, which represents almost 28% of the total land size of the Greater Accra Region. The district shares common boundaries to the north with the North Tongu District, to the east with the South Tongu District and to the west with the Dangbe West District. It is bounded to the south by the Gulf of Guinea, which stretches over 45 km from Kewunor to Wokumagbe. It is also bounded by the Volta River south-eastwards extending to the Gulf of Guinea southwards, thereby forming an estuary, about 2 km from the district capital, Ada-Foah. The main occupations are fishing, fish processing, farming and salt mining (Dangbe East District Assembly, 2010). The major river in the district is the Volta, which meanders slowly into the sea at Azizanya (Acheampong and Hess, 1998).

The area has coastal savannah vegetation, characterised by short savannah grasses, interspersed with shrubs and short trees. There are stretches of coconut trees and patches of coconut groves along the coast. A few strands of mangrove trees such as the Angor mangrove can also be found around the Songhor Lagoon and the tributaries of the Volta River where the soil is waterlogged and salty. The district falls within the south-eastern coastal plains climatic zone which is one of the hottest parts of the country. Temperatures are high throughout the year and range between 23 and 28 °C. A maximum temperature of 33 °C could be reached during the very hot seasons. Rainfall is generally heavy during the major seasons between March and September.



**Fig. 1** Map of the Dangbe East District showing study communities

The average annual rainfall is about 750 mm. The area is however very dry during the *harmattan* season when there is no rainfall at all. Humidity is about 60% due to the proximity of the sea, the Volta River and other water bodies (Dickson and Benneh, 1980).

Anyakpor, Ocanseykope and Ada-Foah are the three case study communities that are the subject of this paper. The basis for the selection of the three communities, and their differentiating characteristics, is provided below through a presentation of the socio-economic status of each of the selected communities and a general description of livelihood activities in the district. The objective is to make clearer the differential experiences and lessons to be deduced from the findings for adequate context for the analysis. In essence, the important questions of which prevailing conditions provide inducement or otherwise to sea flooding-induced migration are brought to the fore. Indeed, this is critical since we argue later on in this paper that communities may be equally exposed to sea flooding but do not have uniform migratory or other adaptive responses to flooding events.

The three communities were selected due to their close proximity to the sea. Ada-Foah is located on the coast but its distance is farthest as compared to the two other communities. Anyakpor, Ocanseykope and Ada-Foah are 136, 359 and 468 m, respectively, from the shoreline (Table 1). Ocanseykope has the highest proportion of households (76.6%) that had experienced sea flooding in the past month at the time of the study. Generally, there were more female than male heads of households in all three study communities, and Ocanseykope had the highest proportion of female household heads (62.0%). This may be attributed to absentee fishermen household heads that travel to neighbouring West African countries for fishing expeditions that last for extended periods. Anyakpor has the highest mean age (41.9 years) for household heads.

**Table 1** Experience of sea flooding, distance to coastline and socio-economic characteristics by community

Variable	Anyakpor	Ada-Foah	Ocanseykope	All communities
Mean distance to coastline (m)	136.1	468.1	359.3	321.2
Households that experienced sea flooding in the past month (%)	71.2	48.8	76.6	53.8
Female household heads (%)	59.0	58.7	62.0	59.7
Mean age of household head (years)	41.9	41.2	37.4	40.3
Heads with no education (%)	54.0	18.7	18.0	28.6
Households with the lowest economic status (%)	10.0	35.3	14.0	22.0
Mean household size	7.9	5.5	6.0	6.3
Households that depend on others for assistance (%)	100.0	81.3	95.0	90.6
Heads engaged in fishing (%)	42.7	23.6	54.4	36.8
Heads engaged in farming (%)	25.3	30.9	23.5	27.4
Heads engaged in skilled manual occupation (%)	2.7	8.9	2.9	5.6
Mean duration of stay of household head (years)	25.5	25.2	27.1	25.8
Migrant household heads (%)	9.0	26.7	26.0	21.4
Unmarried household heads (%)	34.0	44.0	40.0	40.0

Source: Fieldwork, 2012

While the highest proportion of heads with no education is in Anyakpor (54.0%), Ada-Foah has the highest proportion with the lowest economic status (35.3%). Mean household size is highest in Anyakpor (7.9) and the same community has the highest social networks. This is because all the households in Anyakpor depend on other relatives, which may include migrant relatives living elsewhere, for economic assistance. Fishing and farming are the predominant occupations, and while Ocanseykope has the highest proportion of fishermen (54.4%), Ada-Foah has the highest proportion of farmers (30.9%) and those engaged in skilled manual occupations (8.9%) including artisans and craftsmen/women. Finally, mean duration of stay in the community is highest in Ocanseykope (27.1 years), and Ada-Foah has the highest proportion of migrants (26.7%) as well as unmarried household heads (44.0%) probably because it is more metropolitan compared to the other two communities.

Furthermore, there are a number of livelihood options in the study area including vegetable cultivation, oyster shell harvesting, tourism and hospitality jobs and salt, sand and gravel mining. Vegetable cultivation (including onions, cabbages, tomatoes, okra and pepper) mainly undertaken through sprinkler irrigation and therefore done all year round is used to support fishing. The irrigation is done through underground pipes connected from upstream sources of the Volta River (where salinity levels are relatively better) to the farms. Households are able to support their livelihoods with substantial incomes from vegetable cultivation. There are, however, associated land tenure problems regarding women whose husbands have migrated which sometimes result in conflicts. This is because the area practices patrilineal inheritance; males are expected



to inherit customarily, thus, women do not have same access to family lands as men do. As one local woman in the Ocanseykope case study community stated,

The sea these days cannot take care of us anymore because it does not give our husbands enough fish, and the fish we used to catch from the lagoon has also reduced. Thankfully, we are able to support our husbands with the onions. But there is a lot of fighting about land ownership and family ties are growing cold here day by day because they don't give us the land we need for our farms because our husbands are not here with us (Adult woman, Ocanseykope).

Oyster shell harvesting is mainly undertaken by the youth from March to October. In the past, it used to be a year-round economic venture; however, the chief in the area has placed a ban on oyster shell harvesting from November to February. This is to allow the oysters to mature. Oyster harvesting is done in the Volta River through diving to the bedrock and searching for the oysters. Tourism and hospitality is one of the developing industries in the district. The main tourist attractions are marine turtle breeding sites located in the estuary at Totope, Lolonya, Akplabanya and Kewuse, bird watching on the Songhor Lagoon (designated wetland and Ramsar site which is a sanctuary for about 80% of migratory birds that transit in Ghana), fetish shrines, sacred groves, Fort Konestem built in the seventeenth century, cemetery for early missionaries and Asafotufiam festival (Ghana Districts, 2014). The numerous hotels, guesthouses and resorts located on the Volta River also provide water sporting activities including swimming, sailing and boat cruising. Quite a substantial proportion of community members are employed in the tourism and hospitality industry as tour guides, translators, caterers, drivers, security guides, etc. Community members also sell pottery products and weaved mats and baskets to tourists.

Salt mining is another source of livelihood in these communities. The area has a potential of producing 1.2 million tons of salt per annum but currently, only 10% is utilised. It is normally undertaken during the dry season, i.e. from October to March when the water level in the lagoon reduces drastically. However, in seasons where there are delays in the rainy season, salt mining can be undertaken until May. Finally, large-scale sand and gravel mining mainly for the building and construction industries occur in Tehey, Sege and elsewhere along the coast.

## Data and methods

A total of 350 households were selected for a household survey. The selection was based on points derived from a Global Positioning System (GPS) of the various housing structures in the three communities. These formed the basis for a sampling frame for random selection. The selection was done using a random number table of corresponding numbers of structures from the three communities. A listing of all the structures was undertaken and all households in the housing structures were identified. Out of the identified households, 100 each were selected from Ocanseykope and Anyakpor, while 150 were selected from Ada-Foah, in order for the interviews to reflect the populations of the three communities in 2010 according to the Ghana Statistical Service.<sup>1</sup> Every head of a selected household was interviewed.

<sup>1</sup> According the 2010 national census, the population of the case study sites was as follows: Ocanseykope—9835, Anyakpor—8572 and Ada-Foah—17,456.

The interviews were done by the second author and teachers of the Ada Senior High School. The interviews took place from January 28 to February 19, 2012. Questionnaires were administered to respondents for about 30–45 min and responses were recorded. The first set of questions related to evidence of and experience of sea flooding in the household. Sea flooding was conceptualised as a sudden-onset environmental change event and an actual occurrence not a perceived one. These sets of questions were formulated as follows: Do sea floods occur in your community? How often do sea floods occur? What are some of the effects of sea flooding in the community? How do you envisage the current sea flooding situation to be in the future? Do you intend to leave this community in the next year? If so, what will be the reason for your intention to leave? The dependent variable was constructed from respondents who have intention to migrate from community as a result of sea flooding. The second set of questions included sex, age, educational level, marital status, occupation, migration status and duration of stay in community of head of household. The third set of questions was related to the household and included questions on household size and whether household members could rely on friends, relatives or other members of the community during difficult times (social networks). The final set of questions was on household consumer durables and other assets and was used to calculate household wealth quintiles (economic status).

Livelihood options and migration processes were obtained from focus group discussions (FGDs) conducted in the study communities. In all, 12 FGDs were conducted; comprising male and female young adults aged 15–30 years, and male and female adults more than 30 years old for each community. Each group comprised 8–10 members. Discussions were recorded in the local language and later transcribed. To ascertain the factors influencing migration intentions in the communities, a bivariate analysis using the Pearson correlation and multivariate analysis comprising two binary logistic regression models are used in this paper. The first regression model considers experience of sea flooding and intention to migrate. The second model considers experience of sea flooding and intention to migrate, but controls for the influence of all the other socio-economic and demographic variables.

## Community experience of sea flooding and migration

It was generally stated that there is sea flooding and sea water intrusion which has affected groundwater and farmlands. For example, 72% of the respondents held the opinion that the groundwater from the wells was very poor. The highest proportion of respondents with this view is from Anyakpor, due to the town having the closest proximity to the sea. Their assertion was mainly based on visible physical properties of the water such as colour and odour. The rest of the respondents (28%) mainly from Ada-Foah, were, however, of the view that the groundwater from the wells was good or very good. In addition, nearly 70% of respondents had the opinion that sea flooding was the reason for the high salinity in the water. Respondents expressed the manifestation of intrusion of sea water in various ways. For example, 52% of heads of households perceived that the groundwater tasted very salty, while 31% were of the opinion that the water was sour. Furthermore, 53% of respondents indicated that the level of intrusion of sea water was very severe.

Apart from the other effects that sea flooding may cause, one major characteristic of it is coastal erosion. Many households mainly in Anyakpor and Ocanseykope which experienced such phenomena have moved to different parts of the community far from the coast or to other coastal communities and some cities for alternative livelihoods. Sea erosion has also

destroyed the coconut plantations that served as buffer against the inland flooding of the Anyakpor community. Thus, housing structures that used to be far from the shoreline are now as close as 10 m. According to respondents, free access of the sea to the community allows it to cause damage to housing and other infrastructure.

According to community members, there is substantial out-migration from these communities and this has been necessitated by two related factors: Firstly, dwindling fish harvests, and secondly, the destruction of landing sites for fishing boats as a result of inundation and high cliffs. Fishermen have responded to the latter by digging landing spaces for their canoes. However, this practice has rather provided access for the sea during high tides to flow into the communities to destroy valuable properties and arable lands. The situation is worsened further by the fact that some of the canoes get destroyed during landing or when they are being dragged for safe landing ashore. In response to this problem, fishermen keep their boats offshore which has its attendant problems such as theft, damage during high tides at night and damage to the anchors which in turn destroy the canoes.

We have no place to keep our canoes and that is why some of our members have moved to other places. If they want to come home they leave their work over there and come back when necessary (Adult man, Denu).

Apart from migration of non-fishers mainly to Accra, Tema and to a lesser extent, other communities in the Volta River Delta, two main types of migration occur among fishers. The first type is mainly internal, and it is to fishing communities such as Tema, Akosombo, Denu, Afram Plains and Atakpame where there is a harbour or a safe landing place and the second type of migration is mostly across national borders to destinations including Togo, Nigeria and Cameroon.

Many of our brothers and their families have left home for fishing in Denu, Akosombo, Tema, Afram Plains, Atakpame, because it is now almost impossible to land canoes here in this town. The sea flood which occurred in August 2011 destroyed a lot of the canoes here (Chief of Anyakpor).

## Bivariate analysis

As shown in Table 2, community of residence, economic status (wealth) and social networks are significantly associated with intention to migrate due to sea flooding. The highest proportion of household heads with an intention to migrate is recorded in Ada-Foah (72.7%). Ada-Foah is the furthest community from the coastline and probably as a result of that recorded the least proportion of households that experienced sea flooding in the month preceding the survey. Hypothesising that exposure to sea flooding is a trigger of migration intentions, it was expected that Ada-Foah will have the least proportion of household heads with an intention to migrate. However, the results show the contrary, with Ada-Foah recording the highest proportion of household heads with an intention to migrate due to sea flooding. This gives an indication that exposure to sea flooding may not be a primary cause of out-migration and that there could be other political, social, economic and demographic factors at play. The results further show that Ada-Foah recorded the highest proportion of households

**Table 2** Bivariate analysis showing experience of sea flooding, other control variables and intention to migrate in study communities

Variable	Intention to migrate (%)
Experience of sea flooding	
Yes	52.0
No	48.0
Sex	
Male	56.0
Female	55.0
Age	
Less than 20 years	37.5
20–29 years	55.9
30–39 years	55.7
40–49 years	65.3
50–59 years	45.5
60 years and above	58.3
Community of residence**	
Anyakpor	47.0
Ada-Foah	72.7
Ocanseykope	38.0
Level of education	
No education	55.0
Pre-school/primary	48.2
JSS/middle	63.1
SHS/technical	59.1
Higher	58.3
Economic status**	
Low	80.5
Medium	57.8
High	60.9
Higher	35.7
Highest	40.0
Household size	
1 person	60.7
2 persons	60.9
3 persons	44.7
4 persons	64.2
5 persons and more	53.9
Social networks*	
A lot	42.4
Some	56.6
A little	63.4
Not at all	69.7

**Table 2** (continued)

Variable	Intention to migrate (%)
Occupation	
Fishing	52.0
Farming	72.6
Trading	39.3
Professional/clerical	70.8
Manual	72.7
Skilled manual	60.0
Duration of stay in community	
Less than 5 years	69.8
5–9 years	65.9
10 years and above	51.4
Migration status	
Migrant	61.3
Non-migrant	53.8
Marital status	
Not married	56.4
Married/living together	54.8

Source, Fieldwork, 2012

\* $p < 0.01$ , \*\* $p < 0.001$

with migrant heads, as well as highest proportions of household heads engaged in skilled manual occupations and farming. This further buttresses the point raised earlier regarding the role of non-environmental factors in out-migration: migrant populations are known to have higher migration inclinations; people in skilled manual occupations may have the tendency to migrate due to higher chances of securing jobs in destination areas; and farmers may engage in seasonal migration.

Furthermore, the bivariate results show that heads of households with low economic status have the highest migration intentions (80.5%), and households without any social networks at all have the highest migration intentions (69.7%). It is expected that people with limited economic opportunities may have the intention to leave and to seek greener pastures elsewhere; however, the finding on social networks is contrary to what has emerged from other studies which claim that lack of social networks and capital could inhibit migration. This finding could be an indication of the fact that there is a big difference between intention and actual migration action. The story to take away from the statistically significant variables at the bivariate analysis level is that non-environmental factors played a key role in determining migration intentions.

## Multivariate analysis

As shown in Table 3, model 1 considers experience of sea flooding and intention to migrate, and it shows that although not statistically significant, heads of households that

**Table 3** Binary logistic regression results showing experience of sea flooding, other control variables and intention to migrate

Variables	Logit coefficients ( <i>B</i> )	Standard error	Exp ( <i>B</i> )
Model 1			
Sea flooding			
Yes	0.166	0.233	1.181
No (RC)			1.000
Constant	-0.226	0.147	0.798
Nagelkerke $R^2 = 0.1$			
Model 2			
Sea flooding			
Yes	0.137	0.359	1.147
No (RC)			1.000
Sex			
Male	0.071	0.365	1.073
Female (RC)			1.000
Age of household head			
Under 20 (RC)			1.000
20–29	-0.113	0.821	0.893
30–39	-0.739	0.866	0.478
40–49	-0.644	0.954	0.525
50–59	0.449	0.896	1.566
60+	0.402	0.941	1.495
Community of residence**			
Anyakpor (RC)			1.000
Ada-Foah	1.195**	0.517	0.303
Ocanceykope	0.401	0.481	1.493
Level of education			
No education (RC)			1.000
Pre-school/primary	0.573	0.482	1.774
JHS/middle	-0.759	0.483	0.468
SHS/technical	0.246	0.607	1.279
Higher	-0.983	1.138	0.374
Economic status**			
Low (RC)			1.000
Medium	0.574	0.572	1.775
High	0.938	0.586	2.554
Higher	1.918**	0.597	6.809
Highest	1.770*	0.594	5.873
Household size			
1(RC)			1.000
2	-0.257	0.905	0.773
3	0.392	0.770	1.158
4	-0.021	0.771	0.779

**Table 3** (continued)

Variables	Logit coefficients ( <i>B</i> )	Standard error	Exp ( <i>B</i> )
5+	0.131	0.658	0.854
Social networks			
A lot	1.465	0.929	5.448
Some	1.496	0.939	4.755
A little	0.801	0.931	2.227
Not at all (RC)			1.000
Occupation*			
Fishing	-1.347	0.692	0.260
Farming	-1.960*	0.716	0.141
Trading	-0.339	0.750	0.712
Professional/clergy	-1.325	0.776	0.266
Manual	-1.261	0.885	0.283
Skilled manual (RC)			1.000
Duration of stay in community			
Less than 5 years (RC)			1.000
5–9 years	-0.200	0.775	0.817
10 years and above	0.849	0.592	2.332
Migration status			
Migrant (RC)			1.000
Non-migrant	-0.438	0.424	0.645
Marital status			
Married/living together	-0.036	0.360	0.964
Not married (RC)			1.000
Constant	-0.260	1.551	0.284
Model Nagelkerke $R^2$	0.410		

\* $p < 0.01$ , \*\* $p < 0.001$

experienced flooding in the month prior to the survey were more likely to have higher migration intentions compared to those who did not experience sea flooding. Model 2 considers experience of sea flooding and intention to migrate but controls for all the other socio-economic and demographic variables. Two variables that had statistically significant associations with migration intentions at the bivariate stage of the analysis, namely, community of residence and economic status, maintained their statistical significance at the multivariate stage of analysis. The other statistically significant variable is occupation. However, experience of sea flooding is not statistically significant.

First, household heads in Ada-Foah were more likely to migrate compared to household heads in Anyakpor and reasons for this have been provided at the bivariate level of analysis. Second, household heads with higher economic statuses are more likely to intend to migrate compared to those with low economic status and this contradicts the results at the bivariate analysis level. Studies elsewhere do not indicate a clear relationship between economic status and migration intentions as they do with actual migrations. This is probably because the outcome measure is intentions. For

example, while some studies do not find a clear relationship between income and intention to migrate (Papapanagos and Sanfey, 2001), Van Dalen et al. (2005) found out that individuals who received remittances through social and family networks outside of the community of origin had higher migration intentions. That households with higher economic status are more likely to want to migrate could also be due to perceived chances of successful migration in the destination as wealthier households are more likely to have higher access to social and economic capital for survival at migration destinations.

Finally, farmers are less likely to migrate compared to those engaged in skilled manual occupation. This may be due to the fact that the educated or more skilled are more likely to be planning to move because they are more capable to pursue employment opportunities elsewhere. Farmers on the other hand may be less employable in urban areas and may perceive themselves as better off farming within their communities, especially if they own their lands or in instances where land tenure systems may be more favourable than in other areas. Even if farmers intend to migrate, they may do so seasonally.

## Conclusions

A household survey to ascertain the impact of an environmental hazard, i.e. sea flooding on migration intentions in three coastal communities in the Dangbe East district of Ghana showed that significant proportion of the community members perceived coastal inundation as a hazard in the area. In their opinion, this is manifested through coastal erosion, intrusion of sea water into groundwater sources and destruction of farms. The survey also revealed that unlike what pertains in most geographical settings in Ghana, there were more female (mainly engaged in vegetable cultivation and fish processing) than male heads of household in the study communities. This may be attributed to absentee fishermen household heads that travel to neighbouring West African countries for fishing expeditions that last for extended periods.

At the bivariate level of analysis, although not statistically significant, almost half of the household heads that experienced sea flooding in the past month of the survey have no intention to migrate. This finding challenges the idea that sea flooding—or other environmental impacts—is likely to force people to out-migrate en masse. Similarly, the multivariate level of analysis did not show any statistical significance between experience of sea flooding and migration intentions. This clearly demonstrates the complexity of the migration process and decision-making in that there is a non-linear relationship between environmental risk and migration. However, community of residence, economic status and occupation are statistically significant predictors of migration intentions. Various community factors including culture, migration history and levels of development could play important roles in the migration intentions of households. The finding that skilled workers are more likely to intend to migrate compared to farmers may be explained by wage differentials as skilled workers, more than farmers, may perceive wages and need for their labour to be higher in Tema and Accra, industrial and administrative cities in the same region.

The findings of the study thus echo recent findings from Zickgraf et al. (2016) elsewhere in West Africa which suggest that there is not a clear linear relationship



between exposure to sea flooding and out-migration. Even in communities where people are already experiencing sea flooding events, such as the case study communities under investigation here, migration intentions do not necessarily manifest as a result of this. However, as has been pointed out by Zickgraf et al. (2016), those who remain behind in such cases may do so because they lack the social or financial capital to pursue migration. In a context where sea flooding events are likely to become more severe, such populations may become ‘trapped’, in that they lack clear alternative livelihood possibilities and are increasingly exposed to environmental risks. In the case of Ghana’s Volta River Delta, further research is required to better understand not only out-migration but also people’s desire to remain in areas that are prone to such risks.

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