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Climate change and coastal megacities: Adapting through mobility

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ABSTRACT

Climate change poses threats to individuals, communities, and cities globally. Global conversations and scholarly debates have explored ways people adapt to the impacts of climate change including through migration and relocation. This study uses Lagos, Nigeria as a case study to examine the relationship between flooding events, migration intentions as a preferred adaptation, and the destination choices for affected residents. The study draws on a mixed-methods approach which involved a survey of 352 residents and semi-structured interviews with 21 residents. We use a capability approach to analyze mobility decisions following major or repetitive flood events. We found that the majority of affected residents are willing to migrate but the ability to do so is constrained by economic, social, and political factors leading to involuntary immobility. Furthermore, intra-city relocation is preferred to migration to other states in Nigeria or internationally. These findings challenge popular Global South–North migration narratives. Indeed, some residents welcome government-supported relocation plans but others remain skeptical due to lack of trust. Community-based relocation may therefore be preferred by some Lagosians. Overall, this study contributes a nuanced understanding of mobility intentions in response to climate-induced flooding in one of the world's largest coastal cities.

1. Introduction

Human mobilities have gained increased attention as an adaptation strategy in response to climatic threats in the 21st century. These mobilities take on different shapes and forms: from unplanned relocation to wholesale planned resettlement (Danah & Mushtaq, 2011; Ajibade, 2019) and individual and collective migration (Kartiki, 2011; Mortreux & Barnett, 2009). Mobility (climate-induced) is the preferred general term used in this study because it is not prescriptive and allows for the emergence of various forms of movement (Boas et al., 2019), or lack thereof (Carling, 2002; Farbotko & McMichael, 2019; Foresight, 2011). The dominant narrative in the global debate on human mobility responses to climate change is that there will be mass migration from the Global South to North (Boas et al., 2019). This view, however, may give aid to prevalent anxiety and fear of immigrants that pervade immigration policy making (Louis-Charles & Teron, 2017). Although migration is recognized as a climate adaptation strategy (Black et al., 2011a; Black et al., 2011b), when, why, and who adopts this strategy still require scholarly interrogation considering the socio-economic, political and demographic factors that shape such choices (Black et al., 2013). The relationship between people's social vulnerability, exposure to hazards,

and migration patterns in the Global South mandates further analysis.

Beyond the popular push–pull migration factors for understanding human migration, scholars have called for a deeper and broader dimension of migration that consider intrinsic and external factors that shape such aspirations or decisions (de Haas, 2021; Durand-Delacret et al. 2021; Wiegel et al., 2019). Migration choices may be based on individual experiences, risk perceptions, and capabilities (Mortreux & Barnett, 2009; Hunter, 2005; Mistri & Das, 2020). In addition, external political factors may shape people's (im)mobility outcomes (Lubkemann, 2008). In other instances, place attachments make people more likely to stay than move in the face of increased climatic threats (Adams, 2016; Farbotko & McMichael, 2019; Agyeman et al. 2009). Hence, a holistic approach is needed to understand not just the drivers of mobility but also the contextual, geographical nuances, and differential experiences that manifest in people's decision to move or stay.

Cities are important geographic spaces for human mobilities. They are places filled with opportunities (e.g., jobs, education, culture, and infrastructure) as well as challenges (high crime rates, high energy use, poverty, environmental degradation). Different factors shape rural–urban migration, although climate change impacts such as floods, droughts, and subsequent food insecurity are becoming common drivers

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(Kartiki, 2011; Sedova & Kalkuhl, 2020). However, while often driven by those in search of better economic opportunities, the rural-to-urban flow often comes coupled with other socio-economic factors along with exerting stress on urban resources – land, water, jobs, social services, and others. People also migrate and relocate within and between cities. For example, Marandi and Main (2021) have identified sending and receiving cities within the US using a typology. Tracking information on climate migrants is complex and sometimes presents methodological challenges due to data availability (Hoffmann et al., 2021). However, challenges also arise due to the politicization of migration and relocation (Durand-Delacré et al., 2021).

There remains a gap whereby climate-induced mobilities *within* cities receive less attention. The study of climate-induced mobilities in urban contexts is a relatively new lens in which climate migration is being evaluated. Consequently, this allows for substantial inquiry in order to better understand the unique strains and threats that related events may have on urban populations. In recent years, this area of scholarship has been emergent in a range of studies (and across a variety of geographies) including South Asia (Ayeb-Karlsson, 2021), East Africa (Mueller et al., 2020), and West Africa (Rain et al., 2011). Understanding the manifestations of climate-induced migration in urban areas is important for many reasons. Urban areas are growing in population: 68 percent of the world’s population is projected to reside in urban areas by 2050 (UN DESA, 2018). Densely populated cities increase the magnitude of impact following a disaster, thus posing a concern especially for areas that are vulnerable to climate change impacts e.g., informal settlements in cities of the Global South. Thus, understanding the dynamics of climate-induced mobilities and potential outcomes of displacement are of utmost importance, especially for megacities such as Lagos, Nigeria.

This study helps bridge this gap by considering various mobility destination choices – from within cities e.g., Lagos, other States in Nigeria, and internationally. The study also recognizes that beyond *intent* to move is the *ability* to move, which is tied to resource access (Dannenberg, Frumkin, Hess, & Ebi, 2019). We explore expressed intentions to move as an adaptation strategy, those without intentions to move or who use other strategies, and those who seek to move but may be unable to do so, that is, the “trapped population” (Foresight, 2011). This study contributes to the climate migration scholarship in urban contexts by exploring climate mobilities from a major urban coastal megacity – Lagos, Nigeria (Fig. 1). Lagos is one of the most populated megacities in the world, estimated at 21 million people (Lagos State Government, n.d.) and faces significant urban development challenges. The city is vulnerable to climate-related threats including flooding, heat stress, and sea level rise, and therefore offers a unique location for a study on climate-induced mobilities.

We adopt a mixed-methods approach to answer the following questions: i) What short-and long-term strategies do Lagos residents adopt to manage flooding? ii) Is migration a preferred adaptation for flooding? iii) Where is the preferred choice of destination? iv) What informs mobility intentions and destination choices? The goal of this study is to inform climate adaptation policies that are relevant to the needs of affected people.

2. Theoretical framework

Early discourse on climate-induced migration framed migration as a failure of adaptation; this has been referred to as the behavioralist paradigm to climate change (see: Black, Arnell, Adger, Thomas, &



Fig. 1. Map of Lagos. The licensing agreement for the Elsevier published article where it was pulled from is CC BY-NC 4.0. Source: Ekoh et al., 2022

Geddes, 2013). Debates on climate refugees emerged out of that discourse, which has been critiqued to be problematic, masking agendas that exist to create fear or that victimize migrants (Bettini, 2013). A separate and more common discourse in recent times contends that migration is an adaptation strategy (Bardsley & Hugo, 2010; Castles, 2017; McLeman & Smit, 2006; Gemenne & Blocher, 2017; Adger et al. 2021). In the midst of these is the multi-causal approach towards climate-induced migration. In this view, migration is not a linear process but involves a myriad of factors (Black et al., 2013; Castles, 2017; Piguët, Pécoud, & de Guchteneire, 2011) all interacting with each other (Black et al., 2013; Piguët et al., 2011). The factors are environmental, political, economic, social, and demographic (Black et al., 2011a; Black et al., 2011b; Foresight, 2011; Hauer et al., 2020). Piguët et al., (2011, p. 11) astutely note that “if people have already moved for predominantly economic reasons, they could be more likely to move again because of climate change”. However, identifying the influence of environmental/climatic factors among other drivers has been complex for researchers and policy makers. Studies have shown that environmental drivers are hardly identified by migrants as the major reason for past migration decisions (Adger et al., 2021; Safra de Campos et al., 2020). In fact, a study by (Abu et al., 2014) found that climate change as a driver was not a significant predictor of future migration intentions when other socio-economic factors were controlled – illuminating the complexities of isolating environmental/climatic factors as drivers of migration.

Calls have been made, however, to expand the discourse on climate-induced migration towards centering people’s experiences, recognizing the wider spectrum of human im(mobility) responses to the experienced or anticipated impacts of climate change, and the influences of power (Wiegel et al., 2019; Durand-Delacré et al (2021); Cundill, et al; 2021; Boas et al., 2022). The mobilities perspective builds on Sheller & Urry (2006) and Urry’s (2007) work, which consider the movement of both material and intellectual elements. In this perspective, *mobility* is preferred to *migration* as a term because the former reflects the heterogeneity of movement, lack of movement, and/or cyclical forms of movement (Wiegel et al 2019; Boas et al. 2019; Boas et al. 2022).

Building on this diversity of climate mobilities literature, we use the capabilities approach to differentiate between intentions and actual ability to move (de Haas, 2010; Wiegel et al., 2019). The capabilities approach was pioneered by the economist and philosopher, Amartya Sen (1980; 1984; 1999), and further developed by Martha Nussbaum (1988; 1995; 2004) and a growing number of other scholars. The capabilities approach refers to the actual ability of a person to achieve wellbeing and functioning rather than just their rights or freedom to do so. In other words, it is about what people are effectively able to do and to be; that is, their capabilities. This includes the full set of attainable alternatives that a person has, based on resources and on removing obstacles to their lives, so they have more freedom to live the kind of life that they have reason to value (Sen, 1993; 2004). In the context of migration, aspirations or expressed intentions to move may not result in mobility (Carling, 2002; Lu, 1999; de Jong, 2000). Hence, migration intentions may be foundational to understanding future mobility outcomes (Codjoe et al. 2017), and capability is an important indicator of whether people will move. de Haas (2010) explored the intersection of development and (im)mobilities by applying capabilities approach to understand environment or climate change as a driver of mobilities. If mobility is understood as one’s capacity to choose mobilization (as opposed to the actual act of moving or migrating) as De Haas (2021) describes, then capabilities’ influence on migration outcomes can better be directly linked to overall societal well-being and the livelihoods of those potentially impacted by extreme weather events. Supporting this, evidence from India suggests that a range of social indicators (including literacy, access to healthcare) can improve people’s capacity to migrate (Roy and Venema, 2002). In this paper, we focus on the commonalities between the terms – abilities and capabilities, and less on the differences. While distinctions have been made between migration intentions and aspirations (Carling & Schewel, 2018), we use the terms

interchangeably. We view the unifying convention of both terms being that, while people may express intentions concerning future mobility, there are barriers to actualizing these aspirations.

Furthermore, the mobilities perspective advocated by Wiegel et al (2019) offers an even more nuanced understanding of human mobility responses to climate change. This perspective builds on the aspirations-capabilities framework (de Haas, 2021). The mobilities perspective centers the experiences and agency of people in their aspirations or choices to migrate or stay, it recognizes that mobility can manifest in various forms under different contexts, it also recognizes that mobility aspirations and capabilities are not the same for every-one but are shaped by political influences and power dynamics (Wiegel et al, 2019). Our paper contributes to the burgeoning discussion on climate mobilities in the following ways: First, we apply the climate mobilities perspective to an urban context through a case study of Lagos, to highlight the contextual and relational characteristics of climate-induced mobilities. Secondly, our analysis focuses on future (im) mobility intentions rather than past mobility responses. Thirdly, we do not exclude the multi-causality framework in our analysis (see: Durand-Delacré et al., 2021) but integrate it within the climate mobilities perspective for a nuanced understanding of expressed (im)mobility intentions.

3. Case study and methods

Lagos is a coastal megacity in West Africa along the Atlantic Ocean and is amongst the most populated cities on both the continent and planet. Its low elevation makes the city vulnerable to sea level rise (SLR), with potential human displacements from SLR estimated at 3.6 million people (Mehrotra et al., 2009). Lagos’ positioning along the Bight of Benin, its topography, the presence of wetlands, and other physical characteristics (Elias and Omojola, 2015) contribute to its unique and heightened vulnerability to climate-related threats, specifically those brought on in the aftermath of extreme weather events such as the 2011, 2012, 2013 and 2020 floods (Ajibade et al., 2013; Soneye, 2014; Hansen, 2021). In the past two decades, floods (coastal, flash, tidal, and riverine) have caused severe damage to property and buildings, displacement, disruption to everyday life, and even loss of lives. Slaughter and Odume (2017) report the loss of 360 lives and displacement of an estimated two million people following the March 2012 floods that affected almost all Nigerian states. Global climate projections for coastal regions suggest that SLR and extreme rainfall could lead to increased flooding (IPCC, 2021). While limited data in West Africa make it difficult to predict impacts with certainty (IPCC, 2021), intense rainfall events have been predicted for Lagos (Sojobi, Balogun, & Salami, 2016), therefore increased flooding may be expected. A critical distinction in understanding and evaluating climate and flood related threats in Lagos and beyond is discerning between slow-onset change (including temperature change and drought) and fast-onset events (such as super storms). Consequently, the slow/ fast dichotomy informs nuanced human migration and settlement patterns that are reflective of the systemic nature of the event (Cattaneo et al., 2019).

This study employs a mixed-method approach through a sequential explanatory design (Creswell et al., 2003). In this process, quantitative data were collected first and then insights were used to refine the interview protocol. This approach allows for a deeper understanding of the data (Creswell, 2009). It also follows similar approaches applied to the nexus of climate change and migration (see: Crescenzi et al., 2017). Based on Piguët’s (2010) typology of methods in climate migration studies, our study falls under the qualitative method involving interviews and small sample questionnaires. The strength of a qualitative approach relies on its ability to draw from individual narrated experiences to provide insights on climate mobilities (Durand-Delacré et al. 2021), although without the power of generalization (Piguët, 2021; Crescenzi et al., 2017).

The study utilized a non-probability sampling technique, (Brick,

2014) particularly the self-sampling strategy (Sharma, 2017). The self-sampling strategy involved recruiting our target population (individual Lagos residents) to participate voluntarily in the survey. Advertisements were published online through Facebook and Instagram social media platforms. This method was chosen due to COVID-19 restrictions at the time of study. Institutional Review Board (IRB) approval was obtained for this study. While an advantage of online surveys is that they are less expensive and require less human power (Schaeffer and Dillman, 1998), we recognize that with this sampling technique and mode of survey administration, there is a likelihood of self-selection bias (Sharma, 2017; Wright, 2005) and the possibility that people without Internet access or social media presence were excluded from the sample (Ritter & Sue, 2007). The online surveys were administered in the summer of 2020, between April and July. In the survey, respondents were asked to indicate if they lived on the island or mainland areas of Lagos. After data cleaning, 352 complete responses were included in the quantitative analysis, with some variation by question due to respondent omissions (See: Table 1).

Interviewees were selected from survey respondents where individuals were asked to indicate interest in participating in interviews and provided contact information for follow-up. There were 21

Table 1
Survey Sample Characteristics.

Variable	Categories	Frequency	Percentage (%)
Age	18 – 24	69	19.9
	25 – 34	169	48.8
	35 – 44	75	21.7
	45 – 54	22	6.4
	55 – 64	7	2.0
	65 – 74	2	0.6
	75 and Above	2	0.6
Gender	Female	146	44.5
	Male	182	55.5
Education	None	1	0.3
	Primary	1	0.3
	Secondary	51	14.9
	Vocational Training	12	3.5
	Some Undergrad ¹	34	9.9
	Bachelors	193	56.4
	Post-Graduate (Masters/PhD)	50	14.6
Monthly Income ²	Less than N18,000	72	21.2
	N18,000 – N50,000	117	34.4
	N50,001 – N100,000	70	20.6
	N100,001 – N200,000	41	12.1
	N200,001 – N500,000	30	8.8
	Above N500,000	10	2.9
Housing Arrangement	Renting	259	75.7
	Owner/Landlord	41	12.0
	Family House	31	9.1
	Squatting	11	3.2
Location of Residence	Mainland	249	77.3
	Island	73	22.7
Flood Experience	No	141	40.6
	Yes	194	55.9
	Other	2	0.6
	I Do Not Remember	10	2.9
Severity of Flood Experience	Not Severe	17	8.9
	Slightly Severe	26	13.7
	Moderately Severe	59	31.1
	Very Severe	52	27.4
	Extremely Severe	36	18.9
	No Trust	76	39.8
Trust in Government	A Little Trust	49	25.7
	Moderate Trust	40	20.9
	High Trust	14	7.3
	Very High Trust	12	6.3

¹This represents people who have HND and OND non-baccalaureate degrees.

²As of August 30, 2020, the US Dollar to Nigerian Naira exchange rate was \$1 ~ N387.46.

interviewees in total, with 7 identifying as women and 14 as men. Interview participants ranged between 23 and 45 years of age. The aim was to get equal representation of perspectives, but this was limited by those who responded to the interview invitations. Interviews were conducted using WhatsApp phone calls, lasting approximately 30 to 60 min. Measures were taken to protect respondents by obtaining informed consent prior to interviews, password-protecting recordings, and using pseudonyms in written reports. Interviews were transcribed, coded, and analyzed using NVivo 12. Themes of analysis were derived from two iterative coding processes; codes that emerged in conversation with 10 or more of the 21 interviewees were considered to be themes.

4. Results and discussion

We begin this section by setting the stage for our inquiry into future mobility intentions among our survey population. To understand these intentions, we look to the past 10 years to see how people have experienced flood events and their corresponding responses. Furthermore, we engage with the mobilities perspective to examine individuals' future intentions to move or stay, where people aspire to move, what factors may constrain mobility intentions, and how to facilitate adaptive (im)mobilities, given potential structural constraints.

4.1. The past: short- and long-term strategies

Two survey questions addressed prior flood experience. First, respondents were asked if they had been affected by flooding within the past 10 years in previous or current residences. Results in Table 1 show that about 56 % of people were affected by flooding, while approximately 41 % were not affected by floods during this time period. Secondly, survey respondents who reported having been affected by flooding within the past 10 years were asked about the severity of the event, using a scale of 1 – 5. Most respondents ranked the level of severity as 3 on the scale (31.1 %); the second highest group reported 5 on the scale (27.4 %) in terms of flood experiences in the past 10 years.

Those who reported being affected by flooding were asked how they had responded to that flooding. As presented in Fig. 2, below, results reveal that 57 % of people impacted by flooding events in Lagos moved temporarily (n = 104). This supports findings by Birkmann et al. (2016) of temporary relocation as a coping strategy to flooding by some Lagos residents. Further temporary movement response measures emerged in the interviews, whereby it was noted that people moved temporarily after a flooding event to stay with family or friends. Other times, temporary mobility responses may involve people moving to second homes or residences.

This short-term mobility strategy was called “seasonal movement” by Ini, an interviewee (Ini, phone interview, August 26, 2020). Ini mentions that his household copes with flooding by moving to the mainland during the “dry season” and back to the island, during the “rainy season”. Not every-one can apply this strategy, however, since it is dependent on asset capacities. Coping response strategies differ by the capabilities of individuals or households (Kaczan & Orgill-Meyer, 2019; Smit & Wandel, 2006). For example, Elliott and Pais (2006) show that on the USA's Gulf Coast after Hurricane Katrina, moving to a hotel or rented apartment was more common among wealthier evacuees than among low-income displaced persons who had to stay with family or friends, or in shelters.

In Lagos, while some have moved temporarily in the past, others have taken on more permanent relocation strategies to cope with flooding. Results in Fig. 2 show that 12 % of people who had experienced previous flooding events have moved permanently (n = 22). Likewise, Kiki, an interview participant mentioned moving with her family permanently due to repeated and increased impacts of flooding. Kiki's family chose to move to a residential area within Lagos that had better drainage to curb floods. This suggests that repeated experiences of climatic events such as flooding are likely to result in permanent relocation

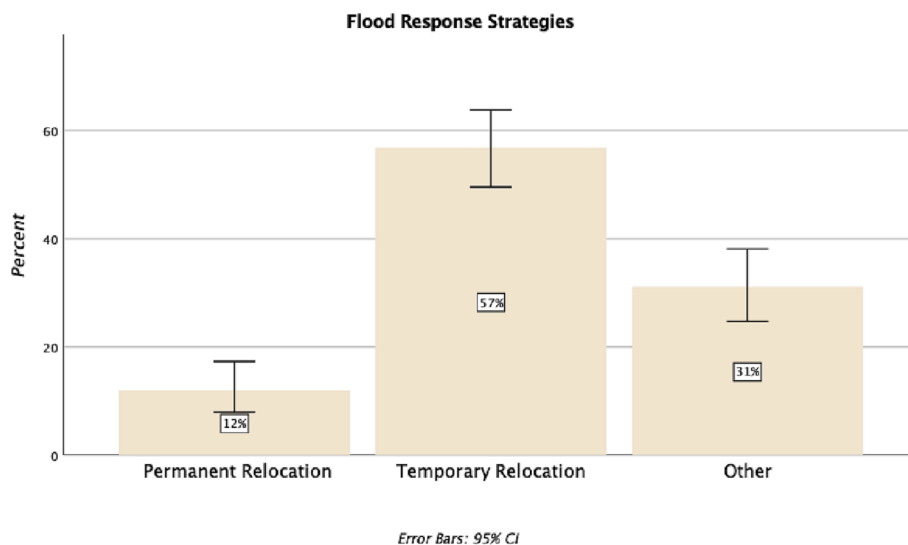


Fig. 2. Past Flood Response Strategies.

within the city or elsewhere, depending on individual or household capacities and choices. It should be noted, however, that some studies have found that permanent mobility choices have been linked to slow-onset events, rather than sudden on-set events such as flooding, (McLeman, 2016).

Beyond mobility responses to flood events, survey respondents who had experienced flooding in the past ($n = 57$) highlighted other forms of coping. People mostly indicated staying back or waiting indoors until flood waters subsided as a coping strategy. In addition, few respondents noted applying structural measures like “temporary bridge” and drainage constructions. These are likely done at a small scale, at the community level. According to an interview participant, structural measures such as housing reinforcements have made flooding impacts “less worse” (Tolu, interview participant, phone, August 20, 2020). At the same time, for others these structural measures have not always been successful at controlling flooding. For example, Kiki, an interviewee, mentioned that although the foundation of her house was raised with cement to curb flooding, “it didn’t work” (Kiki, phone interview participant, September 18, 2020). This experience suggests that the choice of mobility over other adaptation strategies likely indicates the failure of prior in-place coping strategies. Results in Fig. 3 provide insight to this view. The largest number of people in the sample indicated that relocation (35 %) is their preferred way of coping with flooding, greater than drainage fixes (25 %), and waste management strategies (13 %). This may suggest that past non-mobility flood-coping strategies were ineffective at curbing floods, prompting a preference to move. Or given that structural measures can be expensive, people might prefer to move if mobility costs are cheaper. Hence the choice to move should not be regarded as an overall failure to adapt, since mobility itself is an adaptation strategy (Black et al., 2011a; Black et al., 2011b; Foresight, 2011). In such cases, climate-induced mobility may be chosen by individuals or households as a “last resort” (Baldwin & Fornalé, 2017).

4.2. The future: differentiated mobility intentions

4.2.1. Voluntary mobility

Fig. 4 reveals that most respondents (71 %) expressed intent to move as a coping strategy. One reason given for this choice is negative past experiences of flooding: people may be more likely to move to avert future flooding impacts. Kiki, an interview respondent stated:

“I would move oh! because I wouldn’t want to experience what I experienced that time, again. I wouldn’t.”

(Interview participant, Phone, September 18, 2020)

The frequency of flood experiences contributes further to expressed intentions to move in the future (see: Bukvic, Zhu, Lavoie, & Becker, 2018). Risk perception studies show that prior experiences of hazards predict people’s perception of risk (Slovic, 1987; Carlton and Jacobson, 2013; Birkmann et al., 2016; Gotham et al., 2018; Ekoh et al., 2022). In fact, Birkmann’s (2016) study in Lagos showed that prior flood experience led to behavior changes for flood management; such adjustments may include mobility, as revealed in our analysis.

4.2.1.1. *Climate-induced mobilities are multi-causal.* Environmental and climatic factors, as discussed above, are not the only drivers of migration – they are coupled with a myriad of other social, economic, political, and demographic factors (Black et al., 2011a; Black et al., 2011b; Hauer et al., 2020). According to Cundill et al. (2021), a mobilities lens also involves engagement with the interaction of drivers that inform mobility choices. Thus, we asked survey respondents to indicate, on a scale from not at all important to extremely important, how these factors influence their mobility intentions. Results in Fig. 5 suggest that disease (44.5 % “extremely important”) is the greatest factor of consideration in migration intentions. This was not surprising given that our survey was administered during the global COVID-19 pandemic and likely influenced responses. Security (40.4 % “extremely important”) and employment (40.3 % “extremely important”) were the next highest influencing drivers. Among the sampled population, flooding (28 % “extremely important”) also was indicated as a driver of migration, especially taking into account the 44 % who indicated that it was “very important” in their migration decision-making. These findings can be further understood by results from the interviews.

For Tolu, an interviewee, while an issue of concern, flooding alone is unlikely to influence his decision to move:

“Hmnnn... Increased flooding will only cause me to move from Lagos to another state if I will be posted. If I will be posted! Because I can’t leave Lagos because of flooding, and I’ll be going to another state when I will have to leave my job, just because of flooding. If I have to walk on the moon just to go to work, I will have to do that! Than going... without no job in another state. So... I think the migration issue has to do with, are you ready to move and be penniless or you are ready to stay with penny.”

(Tolu, Phone Interview, September 7, 2020)

For Tolu and others, mobility responses are at the intersection of climate drivers and economic factors (see: Kartiki, 2011); flooding alone is unlikely to influence their future mobility responses. The ability to

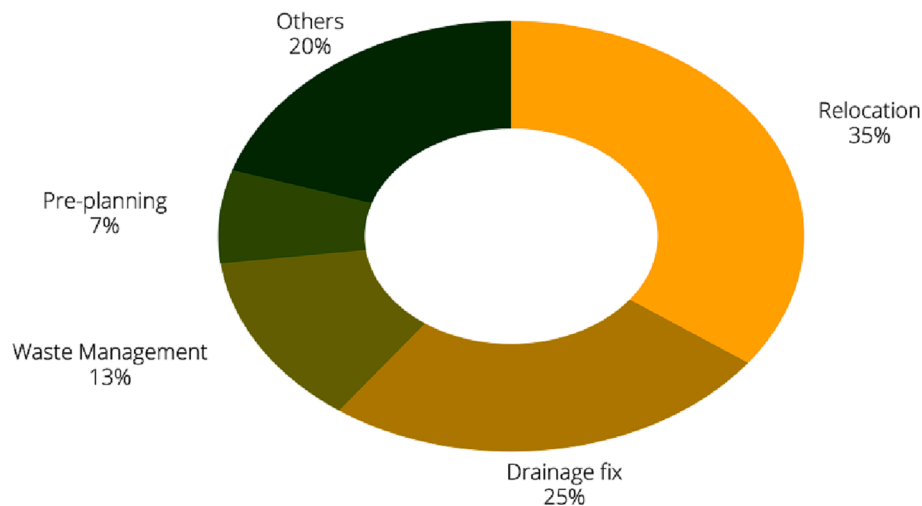


Fig. 3. Current Preferred Flood Coping Strategies (n = 297).

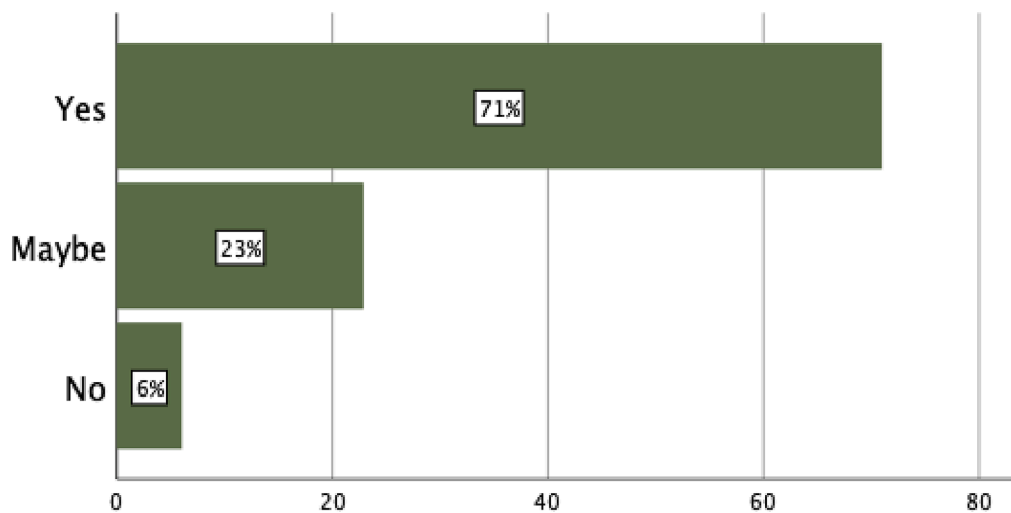


Fig. 4. Future Mobility Intention to Cope with Increased Flooding Events (n = 314).

have or maintain a source of livelihood has an overriding influence on their mobility decisions. This is substantiated by Oma, another interviewee:

“Yes now! If flooding becomes unbearable, I will have to move because it’s not healthy for the kids, even for me myself... My preference would be... if I get a job... that’s the only reason why I will say I’m moving or I’m going for a better business. That’s the only reason why I can say I’m moving. So, if I don’t have any of those things, so there’s no reason of me trying to say I’m moving.”

(Oma, Phone Interview, September 1, 2020)

Interviews also highlighted the roles of security, education, health, and improvement of overall quality of life as additional drivers of mobility, further supporting a multi-causal conceptualization of climate migration (Black et al., 2011a; Black et al., 2011b; Hauer et al., 2020).

4.2.2. (In)Voluntary immobility

Immobility also is a possible response to climate threats. Our results in Fig. 4 indicate that 6 % of the sampled population intend to stay and not move due to future flooding events. The choice to stay can be voluntary or involuntary (Ajibade, Sullivan, & Haeffner, 2020; Black et al., 2013; Farbotko & McMichael, 2019; Zickgraf, 2018; Schewel, 2020; Gruber, 2021). These distinctions are important. It is argued that

voluntary immobility is not given due attention in the literature (Farbotko & McMichael, 2019; Mallick & Schanze, 2020; Zickgraf, 2018). Our findings contribute to im(mobility) studies by highlighting voluntary im(mobility) and the reasons for such choices.

Intentions to stay voluntarily may be for various reasons; these are important to disentangle (Schewel, 2020). For some, staying is because they want to maintain their identity as residents or citizens of a particular location. The role of place attachment and cultural values has emerged from other studies as reasons for people’s decisions to stay (Adams, 2016; Bukvic & Owen, 2017; Farbotko & McMichael, 2019). An interviewee, Ayo, stated:

“I am not even thinking of going international. I don’t want to be a citizen in another man’s country”

(Ayo, Phone Interview, August 28, 2020)

As suggested by the above statement, climate migrants should be recognized and framed as adaptive agents rather than victims who are unable to determine their migration trajectories (Saad, 2017). Agency reflects the freedom to choose to move, where to live, or stay (de Haas, 2021); the ability to exercise this agency is dependent on socio-economic and political factors. Voluntary intentions to stay are informed by a lack of interest in establishing residence in a different location. Recognizing this intrinsic reason for staying reflects respect for

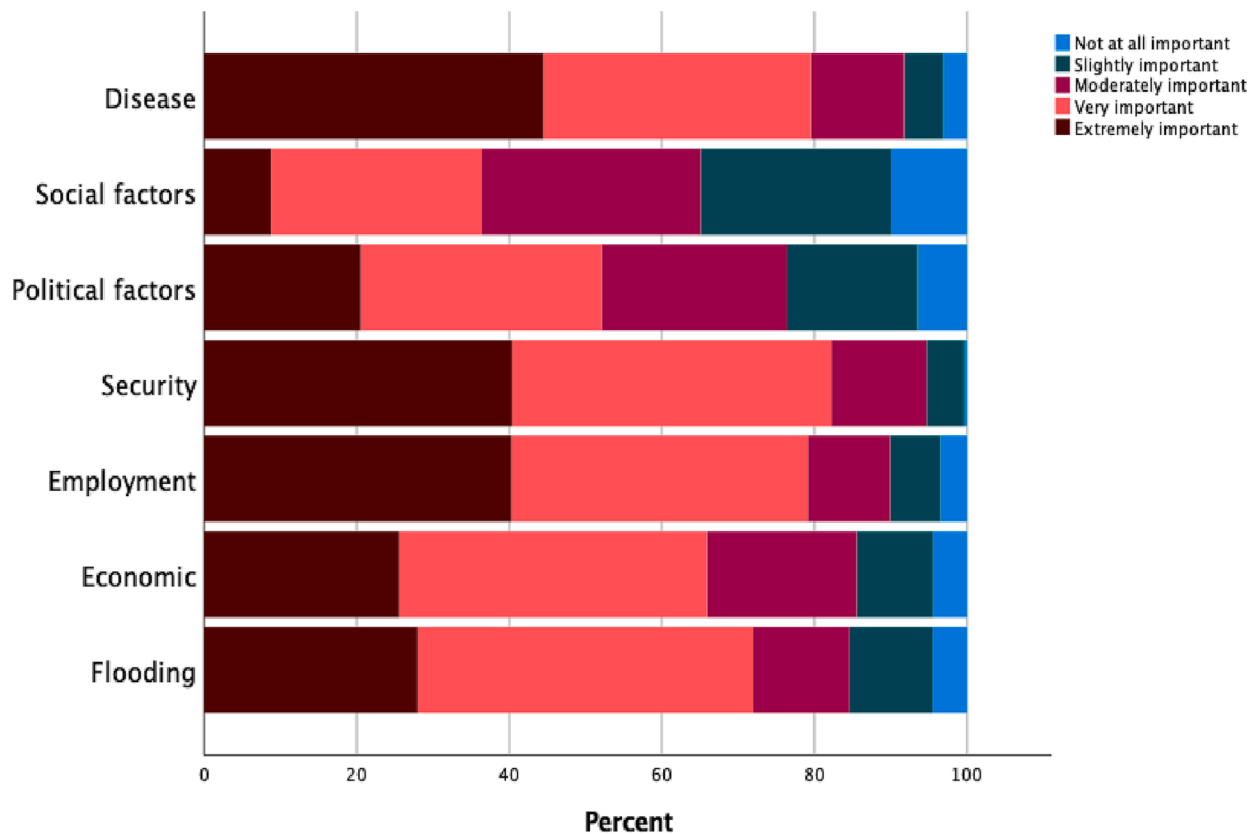


Fig. 5. Multi-Causal Drivers of Migration Among Lagos Residents (n = 254/286).

people’s agency and freedoms for immobility.

Home ownership also emerged as a reason for staying. This is an example of a “retain factor”, defined by Schewel (2020p. 339) as “attractive conditions at home that bolster the preference to stay”. The attractive condition in this case is ownership of material resources. Another reason for voluntary mobility is low flood risk perception. Earlier it was highlighted that high flood risk perception may influence voluntary mobility as a way of coping. Here, the interviews reveal that expressed intentions to stay may be influenced by low perceptions of risk. In which case, these intentions may differ from actual immobility in the future, especially if people’s perceptions of risk increase over time. Also, maintaining livelihoods is a reason for voluntary mobility. This represents an “attractive condition or retain factor” that may keep people in place voluntarily.

On the other hand, there are also populations that are involuntarily immobile (Ajibade et al., 2020); these have been described as “trapped populations” (Foresight, 2011; Black et al., 2011a; Black et al., 2011b; Mallick & Schanze, 2020). While trapped populations may intend to move, socio-economic and political factors can restrict such choices. These constraints are explained by capabilities and are discussed in detail below.

4.3. The future: differentiated capabilities for mobility

While people may have intentions of migrating due to increased flooding events in the future, the capability to move is another factor that determines these choices (Carling, 2002). These capabilities are differentiated. In Table 2, we present a ranked list of constraints to voluntary mobility, informed by our interviews. The ranking represents how often each factor was mentioned. Consistent with findings from other studies, socio-economic and political factors stand out in people’s (in)ability to move in response to environmental and climatic events (Dannenbergh et al., 2019; Van Praag, 2021). Finances emerged as the

Table 2

Constraints to Voluntary Mobility.

Constraint	Ranking ³
Financial	1
Proximity to work or school	2
Stress of moving and adjusting to new location	2
Security concerns at destination	3
Health concerns at destination	3
Lease obligations	3
Immigration policies at destination (international)	4
Social factors	4
Lack of data	4

³Ranking is based on number of coding references in NVIVO.

most highlighted constraint to moving by people who communicated willingness to move. Financial constraints include costs associated with moving, and to acquire a new residence. A study by Seebauer & Winkler (2020) shows that these financial concerns are more prevalent among older residents. Since our study involves mostly younger residents, we deduce that financial concerns may be a factor across various age groups. Hence, the financial capability of individuals rather than their age may be reflected in these concerns.

Interviewees also highlighted proximity to work and school, which may be tangentially related to finances because people prefer to live close to where they work. Moving might increase the distance to their workplaces or school further increasing the financial burdens to the individual or household. For example, this interview respondent stated:

There will be stress on the children, moving from the mainland to the island for school and coming back. It will also be a stress on you, going to pick them and coming back. And imagine if you are also working in Lekki – you have to go work! Then at the end you’ll still come back to the mainland. So, it’s both physical, financial and mental stress.

(Ini, Phone Interview, August 26, 2020)

Lease obligations also emerged as a constraint to expressed mobility intentions. This is the case for renters in Lagos whereby it is difficult to move out of an apartment due to flooding before leases are up (lease contracts are annual in Lagos). This is corroborated by this statement:

“You are stuck because there is no refund in Lagos. It doesn't work, so the only thing to do is... when you are having flooding issues, you probably look for somewhere else and then, look for who will rent your apartment where you get your refunds back. But getting a refund does not work in Nigeria... in Lagos... Definitely!”

(Kiki, Phone Interview, September 18, 2020)

According to [Dundon & Camp \(2021\)](#), renters are often neglected in mobility programs such as managed retreat efforts. Thus, it is imperative for mobility strategies to consider options that allow renters to easily relocate. This may take the form of special arrangements with rental property owners and renters to support lease breaks when residents are exposed to flood risk. However, for renters to consider movement to less vulnerable locations, they need access to the right information. Interview participants revealed that landlords/ladies may withhold information from potential tenants on possible exposure to flood risk. This means that renters can end up moving to other vulnerable places ([Dundon & Camp, 2021](#)) due to inadequate information. Some of the interviewees mention their reliance on personal research to avoid relocating to vulnerable neighborhoods. This reliance on personal research reveals a gap in governance where there are no government advisories that support residency decision-making based on flood risk exposures, nor mandates pertaining to full disclosure by homeowners to renters on risks that the latter may be exposed to upon renting an apartment. Consequently, access to information on flood risk zones is a necessary intervention.

Conversely, for those who may consider international migration an option, restrictive immigration policies may act as barriers to being able to make the move ([Van Praag, 2021](#)). This was revealed through the interviews whereby it was communicated that border restrictions might serve as a deterrent to migrating long distance. Immigration policies must therefore reflect the realities of a climate change threatened world ([Black et al., 2011a](#); [Black et al., 2011b](#)), often impacting the most vulnerable in Global South communities that have contributed minimally to the crisis ([Saad, 2017](#)).

Access to financial resources is one reason why people may not increasingly decide to migrate long distances ([Hassani-Mahmooei & Parris, 2012](#)). Summary statistics in [Table 1](#) show that over half of the sampled population (56 %) make less than N50,000 (\$129)¹ monthly. Ima, an interview respondent, stated:

“Moving out of the country is something that has to be well thought out. Because now we have so many issues. We have border issues, we have issues of pandemics, we have COVID-19 we are facing. We have countries that say oh... we don't want immigrants. So, we have to think about all those things. So, somebody who wants to go out of the country now, one you have to be well loaded as far as money is concerned and you have to find out where... whatever the country you are going to.” (Ima, Phone Interview, August 24, 2020)

While Ima highlights the role of finances in determining migration destination choice, she also underlines immigration policies, termed “border issues” as a key factor.

[Zickgraf \(2019\)](#) emphasizes the need to explore the role of political factors in shaping immobility. Immigration politics on the global scale is often framed negatively, labeling migrants as threats and advancing policies that aim at restricting immigration ([Louis-Charles & Teron,](#)

[2017](#); [Saad, 2017](#)). Amid these debates, others have argued for immigration policies that consider the benefits that migrants bring to their destinations ([UN-Habitat, 2010](#)). At the same time, these considerations have been framed from a climate justice lens. This perspective opines that climate migrants, especially from the Global South, are owed reparations due to their negligible contributions to the climate crisis that may force them out of their homes and countries ([Saad, 2017](#)). Ima's statement thus highlights the role of political rhetoric in keeping people in place when they may be interested in moving as a form of adapting to climate threats. These forms of keeping people trapped, is climate injustice.

4.4. “Intra-city” mobilities and other destination choices

A mobilities perspective explores the contextual nature of mobility intentions (aspirations) ([Wiegel et al., 2019](#)). Whereby knowledge on mobility destinations is important for a nuanced understanding of mobility. Our findings reveal that intra-city mobility is a likely outcome of climate-induced future mobility patterns in Lagos. In our study, among those who expressed intentions of moving, 76 % intend to move within Lagos (see: [Fig. 6](#) below). While internal migration is often conceptualized from an intra-national perspective, which is within countries ([McLeman et al., 2021](#)), attention is needed to mobility patterns that may occur within cities in response to climate threats. These small-scale mobilities are necessary in the “climate mobilities research agenda” ([Cundill et al., 2021](#)p. 2). Furthermore, we argue that considerations of cities within the climate change and migration nexus, need to extend beyond their roles as a destination for migrants, to forms of mobilities that may exist within.

Just as economic factors shape people's mobility intentions, they also influence where people choose as a destination. The choice of intra-city mobility within Lagos is influenced by access to livelihood opportunities in the city, compared to many other parts of the country. These expressions of intent are also shaped by Lagos' reputation as a major urban city, and people's affinity for living in such places. For example, an interviewee stated:

“If I have to... It will have to be outside the country If it is not in Lagos, it's out of the country because Lagos is the ish! Lagos is the New York of the USA. So... that's what Lagos is like to me. So, it's either Lagos or out of the country...” (Kiki, Phone Interview, September 18, 2020)

Conversely, the second highest percentage of the sample population would choose to relocate to another city in Nigeria (13 %). In interviews some respondents revealed that social and economic factors influenced their future intentions of migrating out of Lagos but within Nigeria. The presence of family is a key social pull factor for this potential migration destination choice. Where family networks may provide information, material and other kinds of support that aid resettlement ([Kartiki, 2011](#); [Torres & Casey, 2017](#)). In addition, some interviewees stated that the presence of economic opportunities in other states within Nigeria would make them move if flooding becomes more frequent. These findings emphasize that climate change/environmental factors are just one of the many factors that influence human mobility ([Black et al., 2013](#)).

On the other hand, relocation internationally makes up the lowest choice within the sample at 9 %. Long distance migration may be tied to multi-causal factors that go beyond just flooding events. Access to financial resources may be one reason why people may not increasingly decide to migrate long distances ([Hassani-Mahmooei & Parris, 2012](#)). Summary statistics in [Table 1](#) show that over half (56 %) of the sampled population make less than N50,000 (\$129)⁵ monthly. With such low incomes, mobility intentions for long distance destination choices may seem unattainable.

4.5. Adaptive mobilities and resilience building

The spectrum of (im)mobility intentions that emerged in our analysis

¹ As of August 30, 2020, the US Dollar to Nigerian Naira exchange rate was \$1 ~ N387.46.

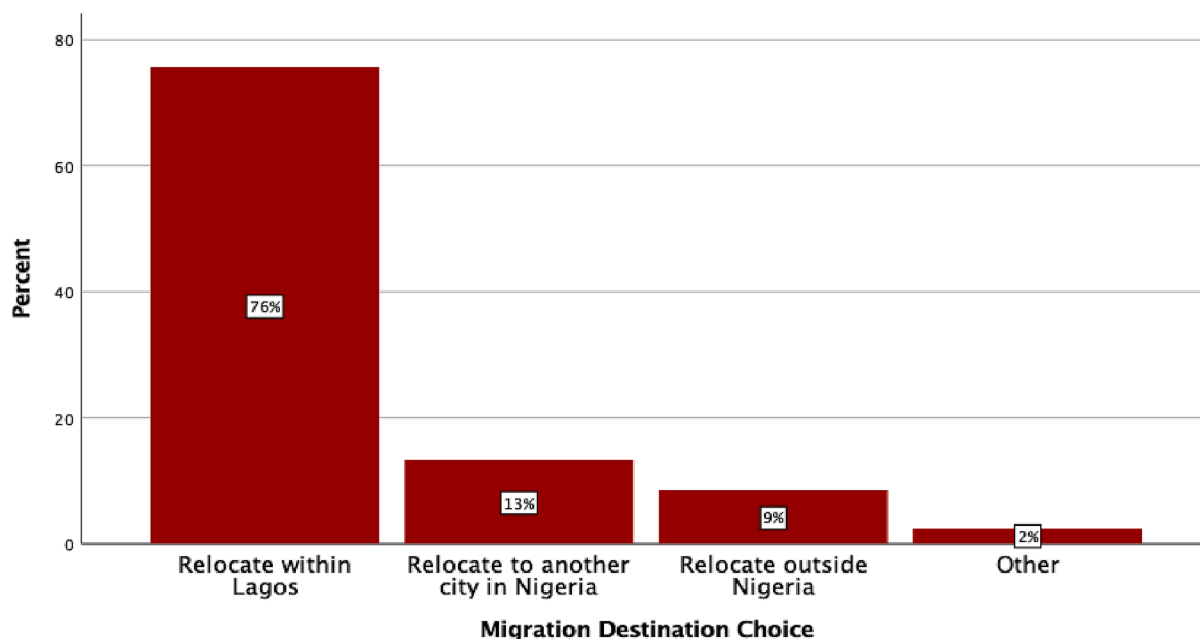


Fig. 6. Preferred Migration Destination Choice (n = 292).

necessitates interventions that enable adaptive mobilities and build resilience. We present recommendations based on emerging revelations from the interviews, on policy areas that can be harnessed. These recommendations are summarized into the following needs especially targeting planned relocation strategies: economic and financial resources, infrastructure and material resources, relocation to less vulnerable locations, maintaining social networks, and respecting the agency of those that move.

4.5.1. Economic and financial resources

Residents who expressed mobility intent communicated the need for economic and financial resources to facilitate mobility responses. Among these are the provision of jobs or ability to maintain current livelihoods, income, and financial support. For example, Kate an interviewee stated:

“...at times I say to myself that if I’m offered a government job, like now I’m a nurse. If I’m offered a government job in...What’s it called... the general hospital in Enugu State, next year... under six months to one year... I’ll move down to Enugu. So, if they are relocating people, they should also give the person a job because relocation is not something you can just relocate! Leaving your present business and present work just like that! So, when... if the government thinks of relocating people, let there be a job position for the person.”

(Kate, Phone Interview, August 25, 2020)

In the above statement, Kate indicates interest in a government-led relocation to another state within Nigeria. However, a major need that is highlighted is job provision, and overall job security. Government jobs are deemed to be more secure than others in Nigeria⁷ and may influence mobility choices for some.

4.5.2. Infrastructure and material resources

Interviews revealed a range of provisions and needs (including affordable housing, access to land, transportation networks, food and information) as essential to facilitating migration in response to future flooding events. Affordable housing is needed in receiving communities to cope with climate-induced mobilities (Li & Spidalieri, 2021). Interview respondents proposed various housing options, from temporary shelters to residences where installment payment structures can be implemented, as well as other temporary housing provisions. For

example, this interviewee stated:

“It will be best if they help with provided allocations! But, if they can’t do that, at least, if it’s just apartments, where you still get to pay, then the payments... that is... the house rent, shouldn’t be on a high rate. At least it should be something that the person that you’re moving, will be able to accommodate... So... it’s either you give them a permanent residence where they won’t pay at all, or you give them a residence where they will pay [in installments] at a low rate... So... I believe that will do!”

(Obi, Phone Interview, September 10, 2020)

In planning for housing provisioning to support climate-induced mobilities, involved stakeholders must avoid replicating injustices that result in unequal housing access for the most vulnerable (Li & Spidalieri, 2021).

Apart from housing, the provision of amenities and structural resources was highlighted. Amenities mentioned include good roads and electricity. Examples can be drawn from previously executed planned relocation projects. In the Living with Floods program for select residents living in flood plain areas along the Vietnamese Mekong Delta, water infrastructure and public health services were provided in resettlement clusters (Chun, 2015). This program was not entirely successful, for unrelated reasons (Chun, 2015), but shows how these services can be deployed in relocation plans.

A few participants also raised the need for information, provided by the environmental conditions of neighborhood options for relocation. This can work to avoid exposing people, especially renters post-buyouts, to vulnerabilities at new locations (Dundon & Camp, 2021).

4.5.3. Relocation to less vulnerable locations

There is a need for planned relocation strategies to avoid exposing vulnerable migrants to physical vulnerabilities in their new locations. One interviewee maintained that:

“...the issue is this, wherever we are being relocated to as an alternative, it will be necessary to find out what the environmental factors there are. Because I won’t want to leave from frying pan to frying pan”

(Ima, Phone Interview, August 20, 2020)

Relocating migrants to these equally or slightly vulnerable locations brings challenges to both migrants and “recipient” communities (Marandi & Main, 2021). More deliberate planning is needed to identify

“climate destinations” (Marandi & Main, 2021) – which are locations that position themselves to receive climate migrants due to being less vulnerable to climatic impacts as well as their ability and willingness to meet other socio-economic needs of migrants while gaining from the benefits of increased populations (Marandi & Main, 2021; Pierre-Louis, 2019).

4.5.4. Maintaining social networks

In this study, finding ways to maintain social networks was highlighted as a need to address for relocation. Studies have shown that attachment to community, especially for long-term residents, creates hesitancy to move (Bukvic & Owen, 2017; Seebauer & Winkler, 2020). However, this does not always translate to preference for community-wide relocation (Bukvic & Owen, 2017). Conversely, among others, community-scale relocation from at-risk residences is welcome (Dannenberg et al., 2019; McNamara, Bronen, Fernando, & Klepp, 2018). An interviewee stated his preference for community-wide relocation. Tolu, the interviewee stated:

“If Mama Bisi will still be cooking... where she is still cooking in the new area, I mean there is no problem [chuckles]. I mean, if the person that is giving you a little lift before will still be giving you a little lift, there is no problem. Provided everybody moves.”

(Tolu, Phone interview, September 7, 2020)

Tolu’s statement above highlights an interest to maintain networks of shared resources and access to familiar services. These could potentially help residents adaptively resettle in new terrains, since their usual social networks are easily accessible.

4.5.5. Respecting the agency of migrants

This need mandates a respect for the right to choose where to migrate to. According to de Haas (2021) people may aspire to migrate or stay, in which case, agency signifies people’s freedom to decide on what mobility looks like for them. This is corroborated by this statement by an interviewee, Obi, who expresses that:

But I think the government should allow me to relocate to wherever I feel is best for me. I think everybody has freedom! Of belonging... freedom of movement and stuffs like that. So, the government should allow me... either government should just ask me to point where I want to stay... And they can find a home for me there. It’s better than the government telling me to come and stay in this particular area or this particular place... So...I will consider moving if government policy on me moving is okay by me... It’s fine by me then there is no problem. I will move.

(Obi, Phone interview, September 10, 2020)

In the above statement, Obi emphasizes that the implementation of government-led relocations would need to include his active participation and consultation on where to move. Relocation schemes should involve active engagement with those that would be moved (McAdam, 2014).

At the same time, it is important to note that not every-one is supportive of government-led relocation strategies. In response to interest in government-led relocation, one respondent exclaimed,

“Ah!! god forbid! I can never accept anything from the Nigerian government. You are [likely] to be worse off than you were. I have zero faith in my government... in our government.”

(Aisha, Phone Interview, August 25, 2020)

Aisha’s statement emphasizes how lack of “faith” or trust in government entities can influence adaptation responses (Birkmann et al., 2016). Experiences or knowledge of previously failed relocation can also play a role in people’s hesitance to accept government led relocation strategies. For example, Femi an interviewee stated:

“We’ve had cases of people who were relocated by the government, and they were left in a very terrible state! So, if one is wise, you better look for

it yourself. Get the relocation yourself. If you wait for the government to come and relocate you, it’s just like dumping people there and forgetting them.”

(Femi, Phone Interview, September 11, 2020)

This interviewee mentions lack of trust in successful relocation by government and would prefer that migrants facilitate movement by themselves. Echoing preference for individual-driven relocations, this interviewee highlighted that:

“... it takes good deeds to bring confidence in people. Especially in terms of government. So, when you look at the racketeering that comes with so many things about them compensating... especially government, you tend not to put your hopes there. Just, once you’ve been signaled that oh... there’s a red zone! there’s a flood prone area! you have to evacuate. Just be the government of yourself and look for somewhere nice for you to put your head. But you trying to think of them... being that source of livelihood for you is a 50–50 chance.”

(Kola, Phone Interview, August 25, 2020)

The above statement further implies that, where there is lack of trust in government, it is imperative for government agencies to prioritize trust building before attempting government led relocations. However, where community-led relocation strategies are chosen, it is also necessary to avoid potentially bureaucratic and institutional barriers that might undermine relocation efforts (Bronen, 2011; Petz, 2015).

5. Conclusion

While climate change presents challenges for communities across the world, cities such as Lagos that have long dealt with coastal flood events face unique challenges. This includes vulnerability amplified by flooding, which is expected to increase in the decades ahead. This paper sought to explore migration as an adaptation strategy to increased flooding by assessing residents’ future mobility intentions and revealed insights on climate migration by showing various mobility pathways and the reasons for the choices. Based on our evaluation, we drew several key insights which increase the understanding of local responses to climate and flood threats. We found that Lagos residents have adopted *in-situ* adaptation strategies, such as structural improvements to curb flooding. At the same time, some have moved temporarily or permanently from vulnerable locations.

Findings from our study underscore the importance of planning for different mobility outcomes (Piggott-McKellar & McMichael, 2021). While a majority (71 %) of surveyed respondents indicated interest in moving if flooding becomes more frequent or intense, about one-third were unsure or revealed no intention to move. The distinctions between (im)mobility options were also revealed: some people voluntarily choose to stay, while others may be “trapped” (Black et al., 2011a; Black et al., 2011b; Otsuyama et al., 2021; Van Praag, 2021; Zickgraf, 2018). Among those who choose to stay, factors such as low risk perceptions, home ownership, and place attachment play a role. Alternatively, finances play a role in people feeling trapped and unable to move. Differences between willingness and ability to move thus are stark (Dannenberg et al., 2019; Van Praag, 2021). The various mobility choices and capacities all deserve attention in research and policy, with important implications for communities facing similar challenges globally.

Planners, researchers, and policy makers are concerned with the destination choices of people who must move due to climate change (Clement et al., 2021); findings from this study show that people may prefer to relocate within the city. We have highlighted that personal finances are a key factor that determine how far people can move. For the urban poor, the lack of finances indeed influences mobility choices. Given this reality, managed retreat or planned relocation strategies involving short distances within the city, might be applicable solutions, while being mindful that city governments must work towards reducing

vulnerabilities and building resilience within cities to support those that choose to stay. These insights may be critical for policy makers, governments, and other climate resilience mechanisms to make planning decisions informed by heightened considerations for which populations are vulnerable to impending threats and may not have the capacity, or desire, to relocate. This should be done in concert with strengthening support for communities that intend on migrating but may face any number of relocation constraints (e.g., availability of safe housing, information sharing).

While certain groups may be open to government-aided relocation strategies, others may not, due to lack of trust. Hence, policy makers working on relocation measures must recognize and respect the agency and needs of individuals and communities – including the right to stay or move and where to move. This may create a substantial conundrum for emergency management and disaster response agencies to deal with, as personal decision making can conflict with broader public safety objectives. Active participation of affected individuals and communities in decision-making should be promoted and mandated to ensure just outcomes and build trust. It may also mean that community-led mobility strategies are preferred, and this should be supported. However, this is not devoid of challenges and should be accounted for in planning. Cities can enable these processes by eliminating barriers within existing financial, institutional, and legal frameworks (Petz, 2015).

For those who do choose to move, certain needs are necessary to facilitate such movement. These include factors related to economic opportunities, low relocation costs, proximity to jobs and social factors (Song & Peng, 2017). Finally, for those who may choose international destinations, restrictive immigration policies are a barrier to movement (Van Praag, 2021). Thus, climate migration should be approached from a justice lens where migrants are not framed as threats but recognized as actively responding to climate change which they contributed less to (Saad, 2017). Beyond framing, policies at the global, national, sub-national and local levels must reflect just approaches by easing restrictions that inhibit mobility. State governments must work more to develop agreements that allow easier accommodations for long- or short-term cross boundary relocation. This can be informed by both bilateral state agreements and overarching policy by the United Nations. While a range of factors from household resources, to ties to place may influence individual decision making on relocation, the broader political economy must afford expanded options for all residents so that these meaningful options and decision making can occur. Overall, dignified mobility must always be prioritized for all people and choices, notwithstanding economic or national background.

CRedit authorship contribution statement

Susan S. Ekoh: Conceptualization, Methodology, Writing – original draft. **Lemir Teron:** Supervision, Writing – review & editing. **Idowu Ajibade:** Supervision, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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