Public Preference of Flood Resilient Housing Technologies in Nigeria: A Case Study of Kogi State.

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Abstract

Purpose - Flood resilient housing technologies can reduce damage and disruption at a household level, particularly in areas where large scale community schemes are not available or feasible. People's perception of floods and their preferences of flood resilient housing technologies are among many very important factors influencing the adoption of these technologies. Therefore, these perceptions and preferences must be well understood before implementation of these technologies can occur. However, studies on these two important factors are lacking in literature, particularly in the Sub-Saharan African context.

Design/Methodology/Approach - Nigerian residents' preferences of flood resilient housing technologies were explored by focusing on five frequently flooded areas around the Niger and Benue River basins in Kogi State, Nigeria. Thirty-eight chat, video and voice call interviews were conducted with participants across five case study areas: Lokoja, Idah, Bassa, Ajaokuta and Koton Karifi. The interviews, informed through an illustrated brochure, covered residents' experiences and perceptions of floods. This was done to gain an understanding of the factors influencing the choice of flood resilient housing technologies adopted and those preferred.

Findings - This study confirms that residents in these five focus areas show similar characteristics to other floodplain residents as encapsulated in Protection Motivation Theory. The flood resilient housing technologies discussed in this study include flood avoidance, flood recoverability and flood resistance strategies, as well as neighbourhood scale approaches. Flood resistance and Flood recoverability strategies, rated highly in terms of suitability and envisaged efficiency in mitigating flooding in Kogi State. Although the measures were mostly agreed to be potentially effective and successful on a household scale, there were concerns as to flood mitigation on a neighbourhood scale.

Originality - The results provide supporting evidence of the factors influencing the choice of and/or intention to adopt flood resilient housing technologies, highlighted in literature. Results also contribute to literature by providing further insight into flood resilient measures already adopted by residents, as well as their preferred housing technologies from the options presented. The implications of these findings and methodological considerations in this research are fully discussed in this paper.

Research Limitations – Pre-existing flood resilient housing technologies) were not extensively discussed in the literature review but were included to have a sense of the participants' mitigation behaviour, as well as their potential to adopt (or not) new measures after adopting previous ones.

Keywords Floods, mitigation, household, neighbourhood. Kogi, Nigeria.

1. INTRODUCTION

1.1 Background

Flooding is a devastating hazard which threatens lives and causes significant economic and social losses globally (Adaji et al., 2019; Omar and Van der Lindt, 2020). Many countries in Africa, Asia and Europe regularly experience severe flooding and suffer such losses (Adelekan, 2016). Flooding has been the most frequent hazard in Africa in the last decade (Umar and Gray, 2022). Nigeria has frequently experienced flooding over the last 50 years and the two most severe floods occurred in 2012 and 2018 (NHSA, 2020, Umar and Gray, 2022). More than half of the states in Nigeria regularly experience and have become highly susceptible to flooding (Olanrewaju *et al.*, 2019). The most severe flooding in Nigeria occurred in 2012, affecting 32 [out of 36] states. 24 of these 32 states were adversely affected by the floods and suffered substantial loses, including Kogi State (Adaji *et al.,* 2019). Nine (9) Local Government areas in Kogi State were adversely affected in 2012 and have been experienced frequent flooding since then, five (5) of which are chosen as the focus areas in this study (Oladoyinbo, 2017). Previous studies give accounts of the disasters, as well as measures put in place for "reactive support" after the disaster (Adaji *et al.*, 2019, p. 2). However, there is little to no research on effective proactive measures to prepare for impending flooding, particularly on the property (building) level (Adaji *et al.*, 2019).

Flood impacts have been identified to exist on the individual (interruptions to livelihoods and social relationships), household (building), and neighbourhood (public property damage) levels (Adelekan, 2010; Nkwunonwo *et al.,* 2016). This study focuses on the household (building) level of impact, to understand how flood experience shapes flood perception and how these attitudes influence the preferences of housing technologies adopted. Emerging ideas surrounding flood adaptation, such as "Room for the River" (van Alphen, 2020), "Making Space for Water" (DEFRA, 2004), "living with floods" (Reynaud *et al.*, 2013) and "aquatecture" (Barker and Coutts, 2016) aim to influence how communities at risk perceive floods. The ideas propose ways of incorporating flooding into everyday life by being prepared for it, through the incorporation of flood resilient housing technologies (Liao, 2012; Barker and Coutts, 2016; English et al, 2016; Wakefield, 2019).

Implementing such ideas requires changes in behaviour and lifestyle. Therefore, exploring and understanding people's perceptions of floods and preferences of flood resilient housing technologies is pivotal to helping resilient communities reduce future losses caused by flooding.

1.2 Concepts and Review of Literature

Concepts and theories relevant to the study, such as risk perception, resilience, protection motivation and mitigation preferences are discussed in this section.

1.21 Perception

Theories like that of von Helmholtz (1821-1894) suggest that perception is based on already-existing knowledge of the world in the preceptor's mind (Gregory *et al.,* 1997). Others like that of J. J Gibson (1904-1979) suggest that accounts of visual perception largely depend on information picked up by the eyes (Gregory *et al.,* 1997).

Risk perception is defined as the perception of imminent threat, arising from a relationship between institutional and cultural perspectives developed in society (Beck, 1982). Flood risk perception describes a concept of analysing the probability of the occurrence of a flood event, the extent of exposure to flooding as well as the severity of damage Terpstra, 2011).

1.22 Protection Motivation Theory

Protection Motivation Theory (Rogers, 1975) states that motivation for protection against a threat depends on how high or low the tendency to encounter that threat is perceived to be (Poussin *et al.,* 2014).

There are four key components of the Protection Motivation Theory: perceived severity of a threat, perceived probability of the threat occurring, efficacy of the recommended preventive measure, and perceived self-efficacy (Rogers, 2010). Later revisions of the theory include threat and coping appraisal, two cognitive processes which have been found to influence mitigation intentions and translate into actions. Threat appraisal captures the extent to which a person perceives they are at risk of experiencing a threat. It comprises of two components: perceived severity (consequence/fear) and perceived vulnerability (probability of risk) (Bubeck *et al.,* 2018). Coping appraisal refers to the cognitive processes people undergo when faced with a threat. It comprises of three components: response efficacy, self-efficacy, and response costs (Bubeck *et al.,* 2018). Coping appraisal informs the preference for implementing different measures as discussed in the next section.

Additional factors found to influence protection motivation include flood experience; risk attitudes; flood risk management policies; social networks and norms; and socio-economic factors, age, trust in public protection, tenancy type, time, [flood] memory, among others (Osberghaus, 2017; Poussin *et al.,* 2014; Siegrist and Gutscher, 2008). Nevertheless, there is a tendency for people to experience a threat and still to fail to protect themselves. Knowledge about an area being flood prone, or the probable threat occurrence does not always translate into the adoption of flood mitigation measures (Bubeck *et al.,* 2018; Poussin *et al.,* 2014; Thieken *et al.,* 2007). Understanding which of these dominates the narrative can help in identifying strategies to increase protective responses.

1.23 Resilience Theory and building level adaptation

Resilience can also be broadly discussed in four (4) ways: physical, social, economic, and institutional (Shah *et al.,* 2018). Being the focus in this study, physical resilience includes the materials and techniques involved in building design, as well as the policies and regulations that support construction targeted at promoting flood mitigation and control (Shah *et al.,* 2018).

Flood resilience refers to a “flood-tolerant” style of flood adaptation on the building (physical) level, embodied by the capacity to tolerate and avoid disaster during flooding (Liao *et al.,* 2016; p.1). Property Flood Resilience (PFR) involves measures designed to either minimize water entry (water exclusion, resistance) or limit internal damage from water that enters the building and thereby speed recovery (water entry, recoverability) (Lamond and Rose, 2018).

1.24 Preferences of flood resilient housing technologies

Studies show that people’s flood mitigation choices are influenced by their individual preferences and priorities (Omar and Van de Lindt, 2020). In Byron’s (2016) study, participants who preferred dams prioritised the risk of failure, economic and social factors; those who preferred the Early Warning Systems prioritised the social cost (such as social support) while those who preferred floodplain reconnection prioritised the environmental benefits in their mitigation choices. Similarly, participants in Rasid and Haider’s study (2002) were grouped into three groups based on their preferred flood prevention measure: flood proofing, relocation and the “do nothing” group. Participants in the flood proofing group preferred sandbagging and ring dike upgrading methods, while those in the relocation group preferred relocating to a

ring-diked neighbourhood. Flood insurance and check dams on tributaries were preferred by participants in the 'do nothing' group.

Studies that compare preferences for different property flood level flood resilience are rare. The results presented in this paper contribute to literature on preferences of flood mitigation measures by providing further evidence of preferred flood resilient housing technologies in Nigeria, those incorporated over time (before and/or after a flood event), as well as the factors influencing these decisions and preferences.

2. METHODOLOGY

A *qualitative exploratory approach* to research was adopted for this study, as it is based on understanding people's experiences (Raudeliuniene, 2018). Relying on people's interpretations of happenings has been established to be authoritative and valid, allowing for subjectivity in understanding the socially constructed meanings people assign to the subject being explored (McEwen *et al.*, 2016; Raudeliuniene, 2018). An exploratory approach embedded in a case study is adopted to achieve its aims and objectives. This approach allows for the discovery of generalisations, leading to the understanding and description of meanings participants attach to flooding and mitigation measures (Danjibo *et al.*, 2019; Stebbins, 2011).

A *case study design frame* was adopted to produce a rich, narrative detail of the study area (Suter, 2012). The five case study areas were chosen to provide an understanding of the household and neighbourhood coping measures adopted by residents, both in urban and rural areas.

2.1 Case Study Area

The case study area is Kogi state, North-central Nigeria, 7° 30′N, 6° 42′E, with a land area of 29,833km^2 (National Population Commission, 2006). It is popularly called the confluence state because of the convergence of rivers Niger and Benue at its capital (Aderoju et al., 2014). The bigger rivers in the state have wide flood plains (lower river Niger is over 1,600 metres) while small streams have narrow valleys (Liman *et al.,* 2015). Annual rainfall is between 1,000 and 1,300mm. Kogi state is chosen as the case study because it is one of the 24 states in Nigeria adversely affected by the 2012 floods and has since then, frequently experienced flooding (Umar and Gray, 2022).

Figure 1. Map of Nigeria, showing Kogi state highlighted in red. Source: worldatlas.com

Kogi State has twenty-one Local Government areas. This research focuses on five Local Government Areas that experience floods annually: *Lokoja, Ajaokuta, Bassa, Koton Karifi (Koton-Karfe),* and *Idah* (Oladoyinbo,2017). These five focus areas (Figure 2) were selected due to their proximity to the rivers Niger and Benue which makes these areas susceptible to river and flash floods (Aderoju *et al.,* 2014).

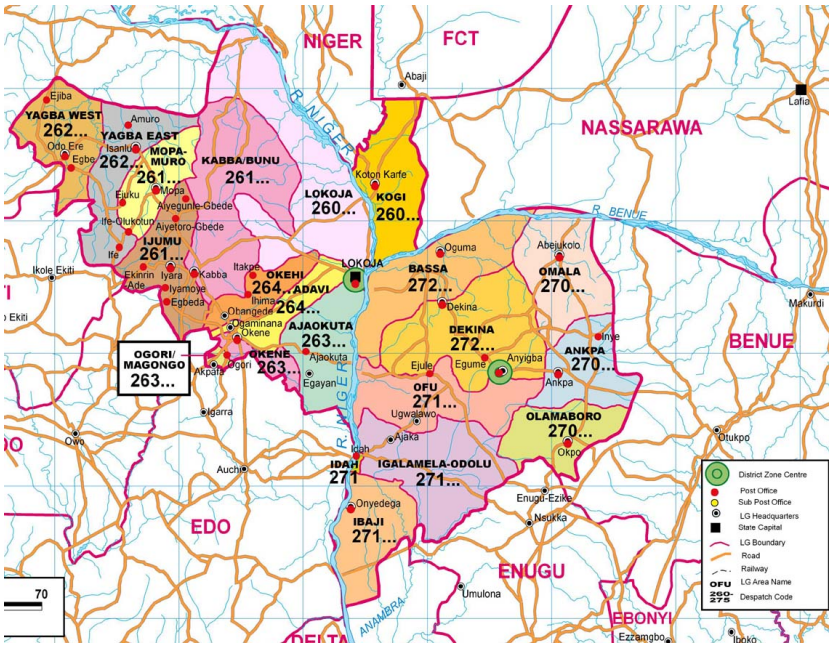

Figure 2. Map of Kogi state showing the rivers Niger and Benue Source: opinion.premiumtimesng.com, 2015

- *Lokoja*

  Lokoja is the administrative capital of Kogi State, situated at the confluence of the Niger and Benue Rivers (Audu, 2016). Most of Lokoja's land area was inundated by the 2012

floods that ravaged 30 of the 36 states in Nigeria (Aderoju et al., 2014; Audu, 2016). Some factors highlighted to be responsible for flooding in Lokoja, include Lokoja's susceptibility to flooding due to its status of being a confluence town; high rainfall intensity, among others (Audu, 2016).

- *Idah*
  Located on the eastern bank of the Niger River, areas such as Ogegele, Nachalo, Angwa and Chekene have been reported to be adversely affected by flooding, due to their proximity to the river Niger (Adeyemi, 2010).

- *Ajaokuta*
  Ajaokuta is along the bank of River Niger (Olatunji et al., 2016). According to participant reports, Ganaja village, a town between Ajoakuta and Lokoja, is mostly affected by flooding while the centre of Ajokuta is less affected due to its rocky topography.

- *Bassa*
  Bassa is bordered at the north by river Benue and in the west by river Niger at the western border, which makes the town susceptible to frequent flooding (Umaru and Adedokun, 2020). Some communities (such as Biroko, Abejukolo, and Bagana) are in low lying areas, increasing their susceptibility (Aderoju et al., 2016; Umaru and Adedokun, 2020).

- *Koton Kairifi (or Koton Karfe)*
  Koton Karfe Local Government Area is on the north of the Confluence of the Niger and Benue rivers, with many of its communities being susceptible to flooding (Adebajo, 2018; Imrana and Haruna, 2017).

Kogi State was chosen not only because it is frequently and adversely affected by floods, but also because it is one of the states with a relatively small amount of flood perception studies available (Adelekan, 2010). These flood perception studies are vital to provide information on residents' perceptions and experiences of floods.

2.2 Data Collection

The target participants were residents (past and present) with various occupations in the 5 focus areas, aged 18 years and older. Participant selection criteria included location (urban or rural area), income, residency type and extent of flood experience.

Flood experience and location were selected to understand their influence on flood mitigation preferences and behaviour. Income was selected to explore any possible effects on preferences of flood resilient housing technologies, as well as intention and capacity to afford these technologies. Residency type (homeownership, tenancy or house-share) was included to understand their potential influence on preferences of and intentions to adopt these technologies.

Based on the concepts and theories of perception, resilience and protection motivation and mitigation preferences discussed above, an interview schedule (including topics such as flood experience, pre-existing and preferred flood resilient housing technologies) was developed to guide the interview sessions. Due to the lockdown arising from the COVID-19 pandemic, online interviews replaced the original plan of face-to-face interviews.

2.3 Participant Recruitment and Sampling Strategy

Participant recruitment in the Urban Areas, such as Lokoja, Idah and Ajaokuta was carried out using advertisements on various social media platforms such as Facebook, WhatsApp, Instagram, and LinkedIn. Interested residents signified interest through the platforms and interview dates were agreed upon between the researcher and the prospective participants.

A minimum sample size of thirty participants was proposed for this study. However, thirty-eight interviews were conducted to ensure that the data reached a point of saturation.

Prospective participants were sent a participant information sheet, consent form and a brief illustrated brochure on flood resilient housing technologies to read before the interview. Due to the lockdown during the pandemic, telephone (voice) and [encrypted] chat (WhatsApp messenger) interviews were used to ensure the safety of the participants. Participants gave verbal (during voice and video interviews) or written (during chat interviews) consent before the interview started. Interview sessions were recorded and transcribed by the researcher.

2.4 Data Analysis

A reflexive approach to Thematic Analysis, as well as Constant Comparative method were used to analyse the data collected. This approach is well suited for a deep reflection on purposeful analysis of and engagement with the data to generate rich and convincing results (Braun and Clarke, 2019; Fielden *et al.*, 2011). Constant comparative method, as the name implies, involves continuously "combing through" the data, comparing elements of each interview with elements in others to "emerge with themes" to summarise contents of the data (Thomas, 2009: 198).

The transcripts were analysed using Braun and Clarke's (2006) six-phase Thematic Analysis Process, which comprises: 1) Getting familiar with the data; 2) Producing Codes; 3) Themes; 4) Fine-tuning the themes; 5) Redefining Final Themes; and 6) Report Writing. Thematic maps were used throughout the analysis to guide the development of themes and consider links between codes and subsequent themes. Themes were refined to ensure that the codes formed a clear pattern and was relevant across the entire data set.

3. RESULTS AND DISCUSSION

Participants were aged between 19 and 44 years, 7 were female and 31 were male. 30 participants were homeowners and 8 were renters. Age, gender, and residential status were not primary factors analysed in this study and none showed any effect on the participants' preference and/or adoption of flood resilient housing technologies. Participants were re-named A-Z, A1-A9 and B1- B3 after transcription.

Table 1 shows participants grouping into 3 categories using 2 sets of coding groups to guide the discussion of the results, formed based on flood experience (FE) and housing technology adopted (HT). The sets of coding groups are 1) Participants with [direct and indirect] flood experience; 2) Participants with no flood experience; 3) Participants with at least one flood resilient housing technology adopted; 4) Participants with no adopted flood housing technology. Participants were grouped into these sets based on the two factors analysed in this study: perception of floods [based on experience or lack thereof] and [post-flood adoption and preference of] flood resilient housing technologies.

PARTICIPANTS CODING GROUP SETS	GROUP DESCRIPTION	CODING GROUP NAME/ ABBREVIATION
FLOOD EXPERIENCE	Participants with [direct and indirect] flood experience	Flood Experience/ FE
	Participants with no flood experience	No Flood Experience/ NFE
HOUSING TECHNOLOGY ADOPTED	Participants with at least one housing technology adopted	Housing Technology/ HT
	Participants with no housing technology adopted	No Housing Technology/ NHT

Table 1. Coding group sets and code names of the study participants. Source: Author's own creation

Participants in each of the coding group sets described above were further grouped into 3 categories:

1. (FE + HT): Participants with flood experience and adopted a housing technology post flooding.
2. (FE + NHT): Participants with flood experience and no adopted housing technology post flooding.
3. (NFE + NHT): Participants with no flood experience and no adopted housing technology post flooding.

The study seeks to understand people's flood experiences [or lack of] and the possible effects of these experiences on preferences of flood resilient housing technologies.

3.1 Initial themes

The initial themes generated using the thematic analysis process are *Flood Experience and perception; Perception of flood resilient housing technology; Preferences of flood resilient housing technology; and Recommendations* and *suggestions*.

Flood Experience and Perception

36 participants had [directly or indirectly] experienced flooding at least once while living in at least one of the focus areas (Flood Experience group). Indirect flood experience was through the empathetic experience of the participants' neighbours. 2 participants had no experience of flooding (NFE group).

Many participants in the FE group described floods a devastating, damaging, horrible experience leading to loss of life, livelihoods, and property:

> H (*FE + HT*): Flood is very terrible especially when you are sleeping at night and suddenly, it is raining, and you wake up from sleep, there's water everywhere in the house or you just wake up and there is no roof on top of you. All your belongings are all over the place floating like important documents, it was not a nice experience your clothes what are you going to wear, food- everything all messed up!

This resonates with evidence in literature which suggests that flood experience is often negative. However, floods were also described in a positive manner, as being advantageous and seemingly beneficial to the neighbourhood.

> Y (*NFE + NHT*): it was really a disaster, a very big one. As a geographer, I tend to check in between some spaces where it happened, and I saw it as a blessing in disguise because afterwards, some things were constructed and rebuilt.

These varied experiences illustrate the validity of Scheopner's (2013) perspectivist view, in which perceptions are formed based on different points of view.

Reported experiences also gave insight into the residents' priorities. While some participants worried about how to salvage private property, other participants prioritized their business or means of livelihood.

> A6 (*FE* + *NHT*): ...it was a terrible experience because it started from the back of the house, came in through the poultry, because we have a poultry behind our house, so we had to start selling off chickens and the likes of it...Then it started coming into the house...little by little...

Flood Experience and Perception Theme: Sub-themes

Two sub-themes arise from the residents' experience and perception of floods 'worry about flooding' and 'reluctance to prepare for flooding'. These sub-themes

Worry about flooding

In accordance with Roger's (1983) Protection Motivation Theory, participants with experienced flooding (FE) showed a high threat appraisal, as they were worried about future flooding. Reasons for participants' concerns mainly arose from attachment to their places of residence, responsibility for the safety of their families, their means of livelihood, and the issue of frequent flooding reoccurrence in the neighbourhood.

> A7 (FE + NHT): I am more worried in terms of uncertainties about farms. In general, I am worried for families whose main source of income is farming... So, since my family's major source of income is farming, I should be worried, so yes, I am worried.

Reluctance to prepare for flooding

A tendency to underestimate flood magnitude and intensity before a flood was observed among participants. This supports the results of previous perception studies which suggest a tendency for people to fail to prepare when faced with an impending threat, due to low perception of the severity of the risk (Bubeck et al, 2013; Harvatt *et al.*, 2011; Siegrist and Gutscher, 2008).

> A2 (FE + HT): We felt the location of our house was in a good place and was not going to be affected by the flood, so we did not move our things we stayed. So, day by day it was like the water keeps coming, so we decided to monitor the flooding, see what is going to happen, then we drew a mark. Before the next morning, the water had gone past the mark.

In resonance with Thieken *et al.*'s (2007) study, which suggests that knowledge could be available to flood prone residents without it necessarily translating into adoption of flood resilient housing technology, participants were reluctant in preparing for flooding even after flood warnings and alerts were provided.

> A (FE + HT): So before, even the flood, there was an impending warning... some people paid deaf ears, they were a bit relaxed, they were nonchalant to the warnings... So, when it [the flood] came, some persons even taught that it would not get to their house, and it got to their house.

This was unexpected in an area that experienced frequent flooding, which could have created a more accurate threat appraisal. Some participant responses implied that the expected severity of frequent floods may be conditioning residents to ignore warnings of more severe floods. As participant I (FE + NHT) (previously resident in Bassa), put it:

> "So, naturally, these communities are often faced with the menace of flooding. The people have been adapted to the situation. However, in 2012 around August and September, the flooding went beyond the normal, at least, by the definition and experience of the people."

Pre-existing and post-flood' housing technologies

Many participants mentioned relocation or building outside of the flood prone areas as a strategy to mitigate against flooding. However, they also recognized that this was not necessarily practical due to the lack of alternative places to live as well as livelihoods of people.

> D (NFE +NHT): Even after a flood, of which they are affected, when the flood water is over, they will still move back to those places. Even, you will observe new people going back to build in those areas. And they seem to say, I have nowhere to go, once the flood is over, I will still go back to my house, I have no alternative.

> A7 (FE + HT): My house was even at the centre of where the flood took place then, we had to take refuge in another home. But… my father's farm is located close to the house, so we had to move back then.

Some participants in the FE group had already opted for flood conscious building designs, and as a result, did not suffer direct damage to or loss of their property. Examples included redirecting flood water via channels, elevating buildings and creating stronger foundations. Participants with flood experience used that experience to select flood resilient housing technologies they felt would help in a future flood.

> A (FE + HT): there are materials that are water resistant, the water cannot affect them. But when it comes to the wooden, and they're soaked with water for a long time they get decayed, so we changed the wood and other materials that can be soaked with water.

Similarly, participants in the FE group who are homeowners adopted more resilient housing technologies post-flooding compared to tenants. Aside from measures paid for by homeowners, tenant-participants only paid for and implemented short-term and/or less expensive recovery measures–such as repainting, rewiring, cleaning, replacement of window nets–or none at all.

However, some participants were not convinced that adopting flood resilient housing technologies post-flooding would make a difference, as they believed flood mitigation would only be effective if it were a shared effort in the neighbourhood.

> A6 (FE + NHT): There was little or nothing we did 'cos as an individual if you prevent it, it all depends on what others do and what the government would still have to do.

Preferences for future flood resilient housing technologies

From the categorisation discussed in Table 2, participants in the 3 categories were further categorised based on their preference [or lack of] housing technologies presented in the study.

1. Preference of at least one proposed resilient housing technology (PHT)
2. No preference of proposed Housing Technology (NPHT)

PARTICIPANT CATEGORIES	PREFERRED AT LEAST ONE PROPOSED TECHNOLOGY (PHT)	NO PREFERRED PROPOSED HOUSING TECHNOLOGY (NPHT)
(FE + HT)	FE + HT/PHT	FE + HT/NPHT
(FE + NHT)	FE + NHT/PHT	FE + NHT/NPHT
(NFE + NHT)	NFE + NHT/PHT	NFE + NHT/NPHT

Table 2. Grouping based on preference of proposed housing technologies. Source: Author's own creation

Many of the participants were interested in the proposed housing technologies and identified one or two they felt would be effective in their neighbourhoods. They mentioned that the avoidance strategy was highly effective and that many places already employed that strategy, often raising on concrete or wood when they could afford to. Some participants with indirect or no flooding experience who did not implement any mitigation measures post-flooding

(FE/NFE + NHT) also agreed that the measures proposed would be effective in their neighbourhood (FE/NFE + NHT/PHT).

> I (FE + NHT/PHT): They are wonderful… If these measures are genuinely applied, many residents prone to flooding will sleep with their two eyes.
>
> Participant F (NFE + NHT/PHT): They will reduce the damage that would be done to houses. Like the elevated houses, Amphibious houses in riverine areas. This would not stop a flood, but it will drastically reduce damages done.

Participants interested in the proposed technologies mostly preferred the avoidance strategy, amphibious architecture, and neighbourhood scale approaches, as the approaches were like the ones already adopted.

> B (FE + NHT/PHT): I would say the flood avoidance strategy would be most applicable; where the houses are built on poles, on concrete elevations such that, if these floods come, they do not get directly into the houses.

Unfamiliar housing technologies, such as the amphibious technology, were also accepted with some positivity by participants. One participant was interested in flood gates and thought they could be adopted. Concerns about the safety of letting water in were expressed in terms of lack of control of water in the home. Keeping water out was preferred (avoidance).

Contrastingly, other participants with flood experience were not convinced that the proposed measures could mitigate flooding (FE/NPHT), partly this could be due to differences in flooding types in and land characteristics of the various focus areas. This resonates with the results of Siegrist and Gutscher's study (2008) in which participants with flood experience were not convinced that they were well prepared against flood, even after adopting a flood mitigation measure.

A third category of participants were those with no flood experience, no housing technologies adopted post-flooding and were not convinced that housing technologies would be effective in mitigating flood impact.

> A2 (FE + HT/NPHT): Until we have good roads, proper drainage systems and well-constructed gutters, the flood cannot be mitigated.
>
> E (NFE + NHT/NPHT): The place is more of a valley. So, there is no assurance when u elevate a building in such place, it will hinder flood because from what I heard, the water keeps extending every year, so the height u elevated a building this year over flooded next year of two years from then.

Some of the measures were perceived to be foreign or alien and therefore, unsuitable for their neighbourhood and lifestyle.

> Participant A9 (FE + HT): There are traditional and cultural issues. Some people prefer to live in their locally built homes to living in a technologically modified home. However, with proper enlightenment, this cultural issue can be surmounted.

Similarities between adopted and preferred housing technologies

Similarities between adopted and preferred housing technologies by participants with flood experience (FE + HT) were highlighted. Participants that adopted housing technologies were inclined to prefer technologies like the ones they had already adopted. Table 3 shows some similarities across the data:

PARTICIPANTS	ADOPTED HOUSING TECHNOLOGY	PREFERRED
A	Flood resistant Materials	Resilience, resistance
M	Concrete walling; Shut drains	

G, Y	Drainage channels	Resistance, Neighbourhood
V	Floodgate	
R, A1	Elevated structure	Avoidance, Amphibious

Table 3. Similarities among preferences. Source: Author's own creation

Envisaged Hindrances

The range of monthly household income was between N20, 000 and N250, 000 (Naira) (35-450 pounds). However, the cost of repairing flood damage and adopting mitigation measures was as high as N 1.8 million (Naira) (3,600 pounds). Although some participants already adopted expensive technologies, finance to fund the measures proposed in this study was a great concern among participants (low self-efficacy).

> Participant V (FE + HT): I think financing would be the major hindrance here. You don't expect a local farmer with a large family of ten or nine per se, to cover that kind of money to build a flood gate. The major hindrance for the people of Bassa is that they are predominantly poor.

Other hindrances expressed include lack of support from the government, corruption, social and cultural issues, unprofessionalism of the authorities, poverty, and illiteracy. In cases where funding was allocated, participants expressed a tendency for authorities to divert these funds or provide inadequate measures.

> Participant M (FE + NHT): The authorities are supposed to give guidelines for building in these areas but all they do is to collect approval fees for these areas without basic infrastructure like drainage at least, to channel water or even warn the populace to avoid those areas.

Participants also pointed to an absence of the much needed "technical know-how" to successfully put these measures in place, as expressed by participant A9 above.

Participants' recommendations and suggestions

Proper enlightenment, state-wide or neighbourhood scale approaches (construction of drainage channels, dredging of the Rivers Niger and Benue, etc.), training and engagement of professionals at the on-set of building in flood prone areas were some of the recurrent recommendations highlighted by participants.

3.2 Emerging Themes

Another theme of *"Abnegation of responsibility"* was generated through re-reading the entire data set. Rather than taking personal responsibility for preparing for flooding, participants blamed other residents for either building in flood plains, returning to flood prone areas after a flood event, or not preparing their household for future flooding.

> Participant K (FE + NHT): Well, you know Nigerians with our mentality. We don't learn from people's experiences. As I speak to you, people are still building in flood areas despite the government's warnings for people to vacate the flood areas.

Participants seemed to believe that preparing for flooding was not directly and solely their responsibility, but the responsibility of the government to equip the entire neighbourhoods and state against flooding. Many participants also blamed the government or local authority for failing to provide household and neighbourhood scale measures for mitigating flooding in the locality.

> Participant B (FE + NHT): …over the years, this responsibility has been abdicated completely by local government authorities, and it is now a situation where everybody decides what to do [on their own] … there are no proper drainage channels, lack of proper survey before houses are built and all of that.

4. SUMMARY OF FINDINGS

The study confirms that participants in these five focus areas show similar characteristics to other floodplain community residents as encapsulated in PMT. They exhibit a similar tendency to perceive flood risk based on their experience, with higher threat appraisal among previously flooded residents and associated motivation to adopt protective measures. About half of the participants with flood experience had adopted at least one flood resilient housing technology post flooding (FE + HT group). Participants who had adopted housing technologies post flooding were confident in their efficacy (responses and coping appraisal). On the other hand, some participants with flood experience did not adopt any housing technologies, even after experiencing floods (FE + NHT). Participants also expressed a lack of trust in authorities and a desire for others to take responsibility for flooding and its mitigation.

Similarities between adopted and preferred housing technologies by participants with flood experience (FE + HT) were highlighted in the study. For instance, participants who adopted drainage channels preferred flood avoidance technologies, participants who had adopted an elevated entrance preferred flood avoidance (amphibious). This resonates with evidence in literature which suggests that people's choices of flood mitigation measures are influenced by their individual preferences.

The flood resilient housing technologies discussed include flood avoidance, flood recoverability, amphibious architecture, and flood resistance strategies, as well as neighbourhood scale approaches. They were rated highly in terms of suitability and envisaged efficiency in mitigating flooding in Kogi State. Residents who had experienced flooding and adopted flood resilient housing technologies were convinced that the measures presented in this study would be successful in mitigating the effect of flooding (high response efficacy). Participants with flood experience who adopted a housing technology post flooding (FE + HT) mostly preferred the flood avoidance, amphibious, and neighbourhood technologies, while participants with flood experience who did not adopt a housing technology post flooding (FE + NHT) mostly preferred the flood avoidance technology.

Contrastingly, some participants with flood experience and adopted a housing technology (FE + HT) did not prefer any of the technologies proposed, as they were not convinced of the effectiveness of the technologies (low response efficacy). Some participants suggested approaches they perceived could be more effective were adequate drainage systems to be provided by the government, or permanent relocation altogether. This is in accordance with Berkes and Ross (2013) in that an integrated approach to flood mitigation not only includes property-level resilience but must also include other resilience-enhancing attributes of a community, such as these stated by the residents.

CONCLUSION

The research aimed to understand residents' perception of floods In Kogi state, and gain insight into their preference for flood resilient housing technologies. Apart from perception of flooding resulting from direct experience, this research highlighted that having a [valid] perception of flooding without a direct experience is possible and that in Kogi state many residents had indirect experiences and insights which they were willing to share. From the research findings, flooding was perceived as part of everyday life, which cannot be stopped or eliminated. Processes for preparing for floods as being the sole responsibility of the government was another view highlighted in the research findings.

Although the proposed property level measures were mostly agreed to be potentially effective and successful on a household scale, there were concerns as to the effectiveness of the measures on a neighbourhood scale. The research participants envisaged hindrances to the adoption of these mitigation measures. Envisaged hindrances included finance, literacy,

suitability of the measures to mitigate the specific flooding type or land characteristics of the area, lack of required equipment and workforce, social and cultural implications, among others. This implies that implementation of such measures would require detailed studies and potentially local support mechanisms.

The results of the study indicate that the housing technologies proposed are acceptable locally and useful, but they cannot be adopted in isolation. Authorities such as NEMA can draw confidence that communities appear to be ready and willing to adopt appropriate measures and that they may seek local collaboration to enhance preparedness in the future.

Incorporating more focus areas is another recommendation for further study, to broaden the scope and gain more insight into the perspectives of residents as regards these housing technologies.

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