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# Perception of Response Efficacy and Residents' Evacuation Response Intention among Flood-Prone River Niger Coastal Residents of Edo State

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**Abstract.** The physical environment is increasingly becoming unsafe for human habitation as natural hazards especially weather-related ones increase in intensity and frequency, adversely impacting human lives and properties leading to what is generally termed as 'natural disasters.' Research on understanding human response behaviour to pre-warning cues especially to direct authorities' directives is crucial effective conducting risk communication. The purpose of this research work is to residents' perception of response efficacy influences their evacuation intention. The descriptive survey design was employed. The study population covers all the households in the Four River Niger communities (Agenebode, Anebete, Udochi, Udaba-ekpere) all in Edo-North Senatorial District, Edo State who have been directed to evacuate to safer grounds. Two of them (Agenebode and Udaba-Ekpere) were randomly selected for the study. A sample size of 384 respondents was reached with the questionnaire instrument but only 358 of the retrieved items were fit enough to be used for the analysis representing about a 93% return rate. The questionnaire instrument is a researcher-structured questionnaire that was validated by three research experts and a Cronbach Alpha reliability of 0.872 was obtained after the validity and the removal of items that loaded poorly. Frequency counts and percentages were used to answer the raised research questions while Logistic Regression Statistics was used to test the formulated hypotheses at a 0.05 significant level. It was found that only 105 (29.30%) of the residents intended to evacuate to safer grounds which is about 30% while the rest about 253(70.70%) intend not to evacuate. Findings indicated that residents' perception of response efficacy significantly influences their evacuation response intention (B = .257, p = .000), Consequently, the need to communicate and engage coastal residents based on consensus protection action among others were recommended.

**Keywords:** Risk Communication, Climate Change, Protection Action, Response Efficacy, Evacuation Intentions.

## 1. Introduction

The physical environment is increasingly becoming unsafe for human habitation as natural hazards especially weather-related ones increase in intensity and frequency, adversely impacting human lives and properties leading to what is generally termed as 'natural disasters. Weather-related extreme events like flooding, hurricanes, wildfires and others are not just increasing in frequency, they are also increasing in intensity (Anderson & Bauch, 2016), thereby bringing untold loss of lives and properties. A twenty years global review of natural disasters revealed that an overwhelming majority of the disasters (90%) are caused by weather-related events like floods, storms, hurricanes and others which claimed 606,000 lives with an additional 4.1 billion people injured, left homeless or in need of emergency assistance (Centre for Research on Epidemiology of Disaster, CRED, and the United Nations Office for Disaster Risk Reduction, UNISDR, 2015).

Flooding is a predominant weather-related extreme event that is devastating virtually the entire country. In the year 2012, the country

experienced a devastating flood disaster due increased rainfall intensity causing the River Niger and River Benue overflow leading to loss of 363 people lives, 5,851 injured, 3,891,314 affected, and 3, 871, 53 displaced (Dia, Wernerman, Grigoryan, Becchi, & Jung, 2012). While it is not within anyone's control to prevent the rainfall in terms of frequency and intensity, this disaster resulting from it would have been averted if residents had responded to early warnings and directives issued out early enough by the relevant authorities (Nigerian Meteorological Agency, NIMET, 2011; NIMET, 2012). Currently, residents in these flood-prone River Niger coastal plains are still in a similar precarious situation as they continue to defy authorities' directive to evacuate to safer grounds (Akintoye, 2016; Irunokha, 2016; Arowobusoye, 2016).

In an Emergency Preparedness and Response (EPR) & Disaster Risk Reduction (DRR) capacity assessment Report, it was estimated that 25 million people or 28% of Nigeria's population live in the coastal zone and are at risk of flooding (Dia, et al, 2012). Experts have set the safe ground in river Niger coastal plain to be from 65 metres above sea level based on the topography of the area (Akpejiori, Ehiorobo & Izinyon, 2017). According to Ehiorobo (2017), any area below this level is considered to be at risk of flooding.

There are no indications that the current intensity and frequency of rainfall during the rainy season will reduce. This is because natural hazard occurrences especially weather-related extreme events like high rainfall intensity and frequency have been associated with the current trend of climate change (Anderson & Baruch, 2006; Intergovernmental Panel on Climate Change, IPCC, 2012). The IPCC (2012) associated the current increase in frequency, intensity and extent of extreme weather events with climate change. Anderson and Baruch (2006) posited that human activities will drive more climate change and more extreme weather events. Therefore, any hope of reducing the increase in natural hazards lies in humans stopping unsustainable environmental exploitation. It can be argued that even if all humans make the needed commitment to the international climate agreement miraculously it will take a long time before any noticeable effect on the current climate change trend and then on natural hazards occurrence.

While humans have little or no control over climatic factors like precipitation frequency, global temperature rise and others which influence extreme weather-related events, they can prevent them from impacting negatively on human lives and properties. In this regard, natural hazard occurrence is not yet within man's control to prevent but they can be prevented from destroying lives and properties up to the level of being termed a 'natural disaster'. Therefore, responding to authorities' directives timely may make the difference between survival and being a victim of a natural hazard impact. Developing Countries appears to have fared badly in successfully getting their residents to evacuate natural hazard-prone region more than Developed countries. Consider these two earthquakes – the California earthquakes on 22 December 2003 and the Iranian city of Bam earthquakes only four days later which was of the same strength on the Richter scale as that of California – but while Bam earthquake killed more than 26,000, the California's earthquake killed only two (International Federation of Red Cross and Red Crescent Societies, IFRC, 2004). In the same vein, In March 2011, Japan was struck by the costliest natural disaster in human history, an earthquake that triggered a deadly tsunami, damaging over $235 billion worth of property but this pale into insignificance in terms of number of deaths when compared with the earthquake of the same magnitude that killed over 230,000 Haitians (Emergency Events Database, EM-DAT, 2017).

The foregoing underscores the rationale behind the paradigm shift in natural disaster research towards the human behavioral factor as key in preventing natural hazards from becoming disasters. Researchers in developed countries have explored several social demographic and psychological factors affecting their residents' response to natural hazards warnings and directives with behavioural intention or with past survivors' experiences using their own peculiar natural hazards at different times (Grothmann & Reusswig, 2006; Marlon, Rosenthal, Feinberg, Pal & Leiserowitz, 2015; Lim, Lim & Piantanakulchai, 2016) which may have explained why they perform better in successfully getting their residents to evacuate hazard prone regions to safer ones hence the low death rate. In these studies, psychological factors such as perceived barriers, perceptions of threat, environmental cues, perception of stakeholders, response efficacy, self-efficacy and others which are extracted from three commonly used theories in natural hazard response studies have been implicated for natural hazard response intention or behaviours (Elder et al, 2007; Terpstra & Lindell, 2012; Marlon, Rosenthal, Feinberg, Pal &

Leiserowitz, 2015; Lim, Lim & Piantanakulchai, 2016). One is not sure if these factors can also apply in the Nigeria's socio-cultural context especially as it pertains to the residents in flood-prone River Niger coastal plains.

Consequently, there exist the need for indigenous researchers in developing countries to explore the factors influencing their residents' response to authorities' warnings and directives using their own particular natural hazards. Against this background, this research seeks to ascertain the factors influencing evacuation response disposition among residents in flood-prone River Niger Coastal plains in Edo State, Nigeria.

### 1.1 Research Objective

The main objective of this research paper is to:

- Examine the evacuation intention among residents in flood-prone River Niger Coastal areas of Edo State,
- ascertain whether residents' perception of response efficacy influences their evacuation intention.

### 1.2 Hypothesis

One research hypothesis was formulated to guide the inquiry:

$H_O$: Perception of response efficacy does not significantly influence the residents' evacuation intention.

## 2. Literature Review

The response efficacy measures can be utilized to assess a person's beliefs as to whether the recommended action step will actually minimize the impact of a natural disaster such as flood. This construct, perceived response efficacy, is a dominant construct of PMT. 'Perceived Benefit' and 'Perceptions of Protective Actions' are the related construct to response efficacy in HBM and PADM respectively. According to Prentice-Dunn and Rogers (1986), response efficacy is a measure of the efficacy of the proposed protective behaviour at averting the threat (Prentice-Dunn & Rogers, 1986). Floyd et al. (2000) reviewed 65 protection motivation studies using a meta-analysis and mentioned that response efficacy and self-efficacy appear to be consistently maintained and related to engaging in protective behaviour.

The construct of perceived benefits is a person's opinion of the value or usefulness of new behaviour in decreasing the risk of developing a disease or being affected by a natural hazard. People tend to adopt healthier behaviours when they believe the new behaviour will decrease their chances of developing a disease or being affected by a natural disaster. In a natural hazard risk response, when an evacuation is required, residents are more likely to adopt the recommended action when its benefits outweigh that of staying behind.

Individuals understand the risk but choose to accept it due to the fact that the perceived benefits of living close to the river appear to outweigh the potential negative impacts (Gough, 2002; Hung, Shaw & Kobayashi, 2007). According to Wachinger, Renn, Begg & Kuhlicke (2013), there are three possibilities because individuals might perceive those benefits outweigh the potential negative impacts. The following three examples expand on these notions (Wachinger et al, 2013): individuals are aware that a specific natural hazard is likely to occur and will have serious personal consequences, but they had other risks (which may be perceived as more serious) to worry about (e.g., social, economic, and security-associated issues were mentioned) (Barberi, Davis, Isaia, Nave & Ricci, 2008).

The need to secure daily livelihoods is mentally more salient than risk perception of natural hazards. Residents with and without hazard experience can judge the threat of a future natural hazard to their livelihood as low and that, therefore, the benefits (e.g., fertile land for agriculture or the beauty of the landscape) outweigh the disadvantages (Gough, 2002; Hung, Shaw & Kobayashi, 2007). A study about floods and volcanic hazards found that if individuals expect worse living conditions after evacuation, or if they are afraid that they cannot protect their property when evacuating their homes, they will stay in a risky area as long as possible (Heijmans, 2001).

In addition, the conditions of evacuation prevent individuals from evacuating even when faced with a major natural catastrophe: during volcanic eruptions individuals did not want to evacuate because of the perceived high risk of dying in the evacuation camps (Haynes, Barclay & Pidgeon, 2008). The allegedly "irrational" behaviour is due to a rational comparison of the risks of staying versus leaving. Renn (2008) suggests that most individuals perceive natural hazards as cyclical phenomena. So, if you endure or survive a

catastrophic event you believe you will not experience another event of this kind during your lifetime (e.g., in the case of a 100-year flood).

Literature review on residents' perception of response efficacy and evacuation response. A study in Uganda (Mertens, Jacobs, Maes, Poesen, Kervyn & Vranken, 2018) explored the link between intentions to plant trees to reduce landslide risk and past experiences, actual exposure, perceived threat and perceived capacity to prevent the occurrence of landslides. The low intention to adopt the recommended protective action was related to low self-efficacy, a closely related term to response efficacy. Janice et al (2021) study of the factors affecting response efficacy of Filipinos under Typhoon Conson 2021 (Jolina) found that self-efficacy significantly influences response efficacy.

A study In the United States (Martin et al., 2007) established response efficacy as significant in influencing homeowners to adopt steps to mitigate the effects of wildfires (Martin et al., 2007). Similarly in Germany, Grothmann and Reusswig (2006) found response efficacy as among other factors significantly influencing residents to adopt protective actions against flooding. Also, in Taiwan, a study found a significant relationship between response efficacy and residents' willingness for disaster preparedness (Tang & Feng, 2018).

## 3. Research Methodology

A descriptive survey research design was used as the design of the study. This design is considered the most appropriate for this study because it allowed a large number of River Niger coastal residents in the various study communities to participate in providing vital data which can be generalized to the study population with the aid of inferential statistics. The study population consists a sum total of 143,815 households (Agenebode = 57, 459; Anebete = 27, 562; Udochi = 24, 897; Udaba-Ekpere = 33, 897) (National Population Commission, NPC, 2017). The study population covers all the residents in the Four River Niger communities (Agenebode, Anebete, Udochi, Udaba-ekpere) all in Edo-North Senatorial District, Edo State who have been directed to evacuate to safer grounds (Irunokha, 2016).

A sample size of 384 respondents was reached with the questionnaire instrument but only 358 of the retrieved items were fit enough to be used for the analysis representing about a 93% return rate. Multi-stage random sampling technique was used to select the respondents. The questionnaire instrument is a researcher-structured questionnaire that was validated by three research experts and a Cronbach Alpha reliability of 0.872 was obtained after the validity and the removal of items that loaded poorly. Frequency counts and percentages were used to answer the raised research questions while Logistic Regression Statistics was used to test the formulated hypotheses at 0.05 significant level.

On scoring of the questionnaire, evacuation intention was scored – I will evacuate = 1, I will not evacuate = 0 and response efficacy was assessed using a Modified Likert scale – SA = 4, A = 3, D = 2, & SD = 1. Negatively worded items were reverse-coded. Four(4) items were used to form response efficacy: (1) I don't think complete evacuation is the solution, (2) Instead of total evacuation, the government can build the River Banks to avoid overflow to the communities, (3) the benefits of staying here in this community are more than leaving to an unknown place, (4) Evacuation is difficult even in the rainy season because it is the period for productive fishing and farming activities, and (5) I may consider evacuation because of possible incentives that government may provide. All items under perceived response efficacy were computed to form one variable called perceived response efficacy.

Results

**Research Question One:** What is the evacuation response intention of residents in River Niger coastal communities, Edo State?

**Table 1:** Evacuation Intentions of residents in flood-prone River Niger Coastal Plains

| | Variable Categories | F (%) |
|---|---|---|
| Evacuation Intention | I will Evacuate | 105 (29.30) |
| | I will not Evacuate | 253 (70.70) |
| | Total | 358 (100) |

Table 1 revealed that a considerable portion of the Edo State River Niger communities' residents, 105(29.30%), indicated that they intend to evacuate to safer grounds as recommended by government authorities while the vast majority of 253(70.70%) decided that they will not evacuate.

**Table 3:** Logistic Regression Analysis of Evacuation Response Intention predicted with response efficacy

| *Predictors* | B | *SE* β | Wald $\chi^2$ | *Df* | P | *Odd Ratio* | 95% C.I. for EXP(B) | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | *Lower* | *Upper* |
| response_efficacy | .257 | .089 | 8.292 | 1 | .004 | 1.293 | 1.086 | 1.541 |
| Constant | -21.025 | 3.164 | 44.153 | 1 | .000 | .000 | | |

The residents' perception of response efficacy is positively correlated with evacuation intention (B = .257) and this association is significant at 0.05 significant level (OR = 1.293, 95% CI = 1.086 – 1.541, *p* =.004). The higher residents perceive the evacuation option as an efficient or right option the more they would intend to evacuate. Holding other predictors constant, holding other predictors constant, on average a one-point increase in perceived response efficacy was associated with an increase in the odds of intending to evacuate by 1.293 times.

## 4. Discussion of findings

Findings indicated that only 105 (29.30%) of the residents intend to evacuate to safer grounds which is about 30% while the rest about 70% intend not to evacuate. This presents a precarious situation as any eventual occurrence of the predicted natural hazard (Akpejiori, Ehiorobo & Izinyon, 2017; Dia, et al, 2012) would lead to a natural disaster that would be beyond the community's adaptive ability even the nations as a whole with enormous negative developmental consequences. This is so because according to the World Bank and United Nations report (2010), disasters simply reveal the results of the interaction between high-intensity natural events (e.g., floods, earthquakes, wildfires and landslides) and earlier combined 'decisions' of individuals and groups on several issues like the decision to evacuate or not. Similarly, Mata-lima et al (2013) posited those Natural disasters result when naturally occurring events whose consequences are often aggravated by man-made actions which surpass the capacity of man's-built infrastructure to contain.

The residents' perception of response efficacy is positively correlated with evacuation intention (B = .257) and this association is significant at 0.05 significant level (OR = 1.293, 95% CI = 1.086 – 1.541, *p* =.004). The higher residents perceive the evacuation option as an efficient or right option the more they would intend to evacuate. Holding other predictors constant, holding other predictors constant, on average a one-point increase in perceived response efficacy was associated with an increase in the odds of intending to evacuate by 1.293 times. This finding fits into the expectation of the literature. For instance, in Floyd et al. (2000) meta-analysis of 65 Protection Motivation studies, it was concluded that response efficacy appears to be consistently related to engaging in protective behaviour. Similarly, in the food industry, Henson et al. (2010) structural equation modelling to investigate the effectiveness of the PMT factors on intention to purchase functional foods products to offset the risk of cardiovascular diseases found response efficacy to have a positive and significant association with functional food purchase intention.

## 5. Conclusion

The study findings indicate that people living in areas tend to be hesitant, about leaving their homes even when instructed to evacuate to places. This hesitation seems to be influenced by how residents perceive the evacuation orders. Specifically, the research identifies that residents' belief in the effectiveness and suitability of the suggested alternatives plays a role in shaping their intentions to respond.

The results suggest that individuals who view evacuation orders as effective and appropriate are more likely to follow them and evacuate as instructed. However, most coastal residents seem to hold the perception that evacuating is not the solution to addressing the flooding risks they face. This implies that despite being told to evacuate they would rather endure flooding events than move to locations.

Understanding the factors that influence residents' response intentions is crucial for developing strategies for dealing with hazards. The study emphasizes the need for interventions that do not stress the importance of evacuation but work, towards enhancing people's perception of efficacy and appropriateness regarding alternative options provided.

Moreover, it is crucial to consider the root causes of people's hesitance to evacuate, such as doubts regarding the effectiveness of evacuation protocols or their emotional connection, to areas. By understanding these factors, we can develop communication strategies that are more precise and persuasive ultimately encouraging behaviour when

confronted with the risks associated with flooding.

## 6. Recommendations

Based on the findings and conclusion, the following are recommended:

- Environmental/health risk communication interventions should be based on an adequate understanding of the target community's perception of the appropriateness of the recommended action
- There should be a community dialogue that ensure the local authorities' and the target communities are on the same page regarding the recommended environmental or health protection action
- Environmental/health risk communication interventions should be based on consensus agreed between local authorities and target communities
- When authorities have to maintain their stand on the recommended environmental/health protection action in spite of the community disagreement, largely due to available scientific evidence or available resources, there should be an appropriate risk communication intervention targeted at convincing the target communities on the rationale behind the recommended action and the need for compliance.

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